Dolby® DP580 Professional Reference Decoder Manual

Issue 3

Part Number 9111530

Dolby Laboratories, Inc.

Corporate Headquarters

Dolby Laboratories, Inc.
100 Potrero Avenue
San Francisco, CA 94103-4813 USA
Telephone 415-558-0200
Fax 415-863-1373
www.dolby.com

European Licensing Liaison Office

Dolby International AB
Apollo Building, 3E
Herikerbergweg 1-35
1101 CN Amsterdam Zuidoost
The Netherlands
Telephone 31-20-651-1800
Fax 31-20-651-1801

DISCLAIMER OF WARRANTIES:

EQUIPMENT MANUFACTURED BY DOLBY LABORATORIES IS WARRANTED AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF PURCHASE. THERE ARE NO OTHER EXPRESS OR IMPLIED WARRANTIES AND NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR OF NONINFRINGEMENT OF THIRD-PARTY RIGHTS (INCLUDING, BUT NOT LIMITED TO, COPYRIGHT AND PATENT RIGHTS).

LIMITATION OF LIABILITY:

IT IS UNDERSTOOD AND AGREED THAT DOLBY LABORATORIES' LIABILITY, WHETHER IN CONTRACT, IN TORT, UNDER ANY WARRANTY, IN NEGLIGENCE, OR OTHERWISE, SHALL NOT EXCEED THE COST OF REPAIR OR REPLACEMENT OF THE DEFECTIVE COMPONENTS OR ACCUSED INFRINGING DEVICES, AND UNDER NO CIRCUMSTANCES SHALL DOLBY LABORATORIES BE LIABLE FOR INCIDENTAL, SPECIAL, DIRECT, INDIRECT, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, DAMAGE TO SOFTWARE OR RECORDED AUDIO OR VISUAL MATERIAL), COST OF DEFENSE, OR LOSS OF USE, REVENUE, OR PROFIT, EVEN IF DOLBY LABORATORIES OR ITS AGENTS HAVE BEEN ADVISED, ORALLY OR IN WRITING, OF THE POSSIBILITY OF SUCH DAMAGES.

Dolby, Pro Logic, and the double-D symbol are registered trademarks of Dolby Laboratories.
Dialogue Intelligence, Dolby Digital Plus, and Surround EX are trademarks of Dolby Laboratories.
All other trademarks remain the property of their respective owners.
© 2014 Dolby Laboratories. All rights reserved.

Part Number
9111530
Issue 3
S14/27176/28217

Regulatory Notices

FCC

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canada

This Class A digital apparatus complies with Canadian ICES-003.

EU/EMC

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Important Safety Instructions

1. CAUTION: Troubleshooting must be performed by a trained technician. To reduce the risk of electric shock, do not attempt to service this equipment unless you are qualified to do so.
2. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
3. This apparatus must be earthed (grounded) by connecting to a correctly wired and earthed power outlet.
4. Ensure that your mains supply is in the correct range for the input power requirement of the unit.
5. In order to reduce the risk of electrical shock, the power cord must be disconnected when the power supply assembly is removed.
6. This equipment is intended to mount in a suitably ventilated 19" rack; ensure that any ventilation slots in the unit are not blocked or covered.
7. CAUTION: This equipment contains a lithium battery. Danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type. Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water. Dispose of the used battery in accordance with local law.
8. The mains power disconnect device for this unit is the IEC320 C13 plug-in mains cord rather than a power switch. The mains cord must remain readily accessible for disconnecting mains power.

9. To avoid exposure to dangerous voltages and to avoid damage to the unit, do not connect the rear panel Ethernet port to telephone circuits.
10. As the colours of the cores in the mains lead may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:
    - The green and yellow core must be connected to the terminal in the plug identified by the letter E, or by the earth symbol ⏚, or coloured green, or green and yellow.
    - The blue core must be connected to the terminal marked with the letter N or coloured black.
    - The brown core must be connected to the terminal marked with the letter L or coloured red.
11. This apparatus must be earthed.

CAUTION – Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type. Dispose of used batteries according to local law.

PRODUCT END-OF-LIFE INFORMATION

This product was designed and built by Dolby Laboratories to provide many years of service, and is backed by our commitment to provide high-quality support. When it eventually reaches the end of its serviceable life, it should be disposed of in accordance with local or national legislation.

For current information, please visit our website at: www.dolby.com/environment.

This symbol that appears on the unit rear panel is intended to alert the user to the presence of uninsulated “dangerous” voltage within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

This symbol is intended to alert the user to the presence of important safety operating and maintenance instructions.

IMPORTANT SAFETY NOTICE

This unit complies with safety standard EN60950-1 as appropriate. The unit shall not be exposed to dripping or splashing and no objects filled with liquids, such as coffee cups, shall be placed on the equipment. To ensure safe operation and to guard against potential shock hazard or risk of fire, the following **must** be observed:

GB

- Ensure that your mains supply is in the correct range for the input power requirement of the unit.
- The unit **must be earthed** by connecting to a correctly wired and **earthed** power outlet.
- The **power cord** supplied with this unit must be wired as follows:

Live—Brown Neutral—Blue Earth—Green/Yellow

IMPORTANT – NOTE DE SECURITE

Ce materiel est conforme à la norme EN60950-1. Ne pas exposer cet appareil aux éclaboussures ou aux gouttes de liquide. Ne pas poser d'objets remplis de liquide, tels que des tasses de café, sur l'appareil. Pour vous assurer d'un fonctionnement sans danger et de prévenir tout choc électrique ou tout risque d'incendie, veillez à observer les recommandations suivantes.

F

- Le selecteur de tension doit être placé sur la valeur correspondante à votre alimentation réseau.
- Le materiel doit être correctement relié à la terre.
- Le cordon secteur livré avec le materiel doit être cablé de la manière suivante:

Phase—Brun Neutre—Bleu Terre—Vert/Jaune

WICHTIGER SICHERHEITSHINWEIS

Dieses Gerät entspricht der Sicherheitsnorm EN60950-1. Das Gerät darf nicht mit Flüssigkeiten (Spritzwasser usw.) in Berührung kommen; stellen Sie keine Gefäße, z.B. Kaffeetassen, auf das Gerät. Für das sichere Funktionieren des Gerätes und zur Unfallverhütung (elektrischer Schlag, Feuer) sind die folgenden Regeln unbedingt einzuhalten:

D

- Der Spannungswähler muß auf Ihre Netzspannung eingestellt sein.
- Die Erdung des Gerätes muß über eine geerdete Steckdose gewährleistet sein.
- Das mitgelieferte Netzkabel muß wie folgt verdrahtet werden:

Phase—braun Nulleiter—blau Erde—grün/gelb

NORME DI SICUREZZA – IMPORTANTE

Questa apparecchiatura è stata costruita in accordo alle norme di sicurezza EN60950-1. Il prodotto non deve essere sottoposto a schizzi, spruzzi e gocciolamenti, e nessun tipo di oggetto riempito con liquidi, come ad esempio tazze di caffè, deve essere appoggiato sul dispositivo. Per una perfetta sicurezza ed al fine di evitare eventuali rischi di scossa êlettrica o d'incendio vanno osservate le seguenti misure di sicurezza:

I

- Assicurarsi che il selettore di cambio tensione sia posizionato sul valore corretto.
- L'apparecchiatura deve avere un collegamento di messa a terra ben eseguito; anche la connessione rete deve avere un collegamento a terra.
- Il cavo di alimentazione a corredo dell'apparecchiatura deve essere collegato come segue:

Filo tensione—Marrone Neutro—Blu Massa—Verde/Giallo

AVISO IMPORTANTE DE SEGURIDAD

Esta unidad cumple con la norma de seguridad EN60950-1. La unidad no debe ser expuesta a goteos o salpicaduras y no deben colocarse sobre el equipo recipientes con liquidos, como tazas de cafe. Para asegurarse un funcionamiento seguro y prevenir cualquier posible peligro de descarga o riesgo de incendio, se han de observar las siguientes precauciones:

E

- Asegúrese que el selector de tensión esté ajustado a la tensión correcta para su alimentación.
- La unidad debe ser puesta a tierra, conectándola a un conector de red correctamente cableado y puesto a tierra.
- El cable de red suministrado con esta unidad, debe ser cableado como sigue:

Vivo—Marrón Neutro—Azul Tierra—Verde/Amarillo

VIKTIGA SÄKERHETSÅTGÄRDER!

Denna enhet uppfyller säkerhetsstandard EN60950-1. Enheten får ej utsättas för yttre åverkan samt föremål innehållande vätska, såsom kaffemuggar, får ej placeras på utrustningen. För att garantera säkerheten och gardera mot eventuell elchock eller brandrisk, måste följande observeras:

S

- Kontrollera att spänningsväljaren är inställd på korrekt nätspänning.
- Enheten måste vara jordad genom anslutning till ett korrekt kopplat och jordat el-uttag.
- El-sladden som medföljer denna enhet måste kopplas enligt följande:

Fas—Brun Neutral—Blå Jord—Grön/Gul

BELANGRIJK VEILIGHEIDS-VOORSCHRIFT:

Deze unit voldoet aan de EN60950-1 veiligheids-standaards. Dit apparaat mag niet worden blootgesteld aan vocht. Vanwege het risico dat er druppels in het apparaat vallen, dient u er geen vloeistoffen in bekers op te plaatsen. Voor een veilig gebruik en om het gevaar van electrische schokken en het risico van brand te vermijden, dienen de volgende regels in acht te worden genomen:

NL

- Controleer of de spanningscaroussel op het juiste Voltage staat.
- Aansluiting van de unit alleen aan een geaarde wandcontactdoos.
- De netkabel die met de unit wordt geleverd, moet als volgt worden aangesloten:

Fase—Bruin Nul—Blauw Aarde—Groen/Geel

Table of Contents

Chapter 1 Introduction 1

1.1 DP580 Front and Rear Panels 2
1.1.1 DP580 Front Panel 2
1.1.2 DP580 Rear Panel 4

Chapter 2 Using the DP580 7

2.1 Installing the Hardware 8
2.1.1 Connecting the Multichannel Analog Output 9
2.1.2 Starting Up the System 9
2.2 Configuring the Network Settings 10
2.3 Connecting to the DP580 11
2.4 Exploring the Web Client User Interface 11
2.4.1 Navigation Bar 11
2.4.2 DP580 Display Bar 12
2.4.3 Input Source Display 12
2.4.4 Output Mode and Compression Controls 13
2.4.5 Audio Output Meter 13
2.4.6 Loudness Displays 13
2.5 Monitoring IP Input 14
2.6 Monitoring AES Input 15
2.7 Monitoring ASI/SDI Input 16
2.8 Monitoring HDMI Input 16
2.9 Generating Media Files 17
2.9.1 Playing Media Files 17
2.9.2 Generating A/V Sync Files 18
2.9.3 Streaming External Files 18
2.9.4 Monitoring HDMI Audio Return Channel Transmitter Output 19
2.10 Monitoring HDMI Audio Return Channel Receiver Input 20
2.11 Checking the Loudness Status 20
2.11.1 Changing the Loudness Display 22
2.11.2 Downloading Loudness Logs 22
2.11.3 Loudness Parameters 23
2.11.4 Checking the Event Logs 24
2.12 Modifying the Processing Configuration 25
2.12.1 Decoder Configuration 25
2.12.2 Dolby TrueHD 29
2.12.3 Dolby Digital and Dolby Digital Plus Configuration 29
2.12.4 Dolby E Configuration 30
2.12.5 AAC and HE AAC Configuration 30
2.12.6 Dolby Pro Logic Configuration 31

2.13 Configuring Loudness Measurement....34
2.13.1 Measurement Configuration Parameters....34
2.14 Modifying the Output Configuration....34
2.14.1 Output Configuration....35
2.14.2 Volume Configuration....35
2.14.3 HDMI Sink Device Status....36
2.14.4 EDID Configuration....36
2.14.5 HDMI ARC Sink Status....36
2.15 Modifying the Network Settings....37
2.16 Using the Administrative Controls....37
2.17 Resetting Factory Defaults from the User-Control Screen....39

Chapter 3 Associated Audio Mixing....41

3.1 Configuring Associated Audio Mixing....41
3.1.1 Mixing Associated Audio from a Single PID....41
3.1.2 Monitoring an Associated Stream Only (Single PID)....42
3.1.3 Manually Mixing an Alternative Associated Stream....43
3.2 Mixing Associated Audio with Dual Packet Identifiers....43

Chapter 4 Dolby E Decoding Behavior....45

4.1 Dolby E Program Selection....45
4.2 Dolby E Metadata Emulation....45

Appendix A Dolby DP580 Specifications....47

A.1 Processing Capabilities....47
A.2 Environmental Characteristics....48

Index....49

List of Figures

Figure 1-1 DP580 Front-Panel Components 2
Figure 1-2 DP580 Rear Panel 4
Figure 2-1 DP580 Rear Panel 9
Figure 2-2 25-Pin D-Connector Pinout 9
Figure 2-3 User-Control Screen After Startup 9
Figure 2-4 Front-Panel Navigation Keys 10
Figure 2-5 DP580 Web Client Input Screen 11
Figure 2-6 Navigation Bar 12
Figure 2-7 DP580 Display Bar 12
Figure 2-8 Input Source Display 12
Figure 2-9 Output Mode and Compression Display 13
Figure 2-10 Audio Output Meter 13
Figure 2-11 Loudness Display Menu 13
Figure 2-12 Select IP as the Input 14
Figure 2-13 Source IP Information (Transport Stream with Metadata) 15
Figure 2-14 Source IP Information (Dolby E Transport Stream with Metadata) 15
Figure 2-15 HDMI Input Source (Dolby TrueHD) 17
Figure 2-16 Setup/Generate Menu 18
Figure 2-17 File Filters and File Selection Menu 18
Figure 2-18 Internal and External Files 19
Figure 2-19 Stream Generation Control 19
Figure 2-20 HDMI ARC Selection 19
Figure 2-21 Select ARC Receiver Input Source (Dolby Digital with Metadata) 20
Figure 2-22 Loudness Screen 21
Figure 2-23 Select Loudness Parameter 22
Figure 2-24 Download Loudness Logs Screen 22
Figure 2-25 Level Menu 24
Figure 2-26 Category Menu 25
Figure 2-27 Start Time/End Time Fields 25
Figure 2-28 Decoder Configuration Options 26
Figure 2-29 Line Cut Menu 28
Figure 2-30 Tech Bulletin 11 Option 29
Figure 2-31 Dolby Digital and Dolby Digital Plus Configuration Parameters 29
Figure 2-32 Associated Audio Mixing Menus 30
Figure 2-33 AAC and HE A AC Default Program Reference Level Menu 31
Figure 2-34 Dolby Pro Logic Configuration Parameters 31
Figure 2-35 Dolby Pro Logic II Music Mode Menus 33
Figure 2-36 Peak and Loudness Filter Options 34
Figure 2-37 HDMI Sink Device Screen 36
Figure 2-38 Admin Screen Displays New Software Version After Rebooting 38
Figure 2-39 Front-Panel Navigation Keys 39
Figure 3-1 Associated Audio Mixing Menus 41
Figure 3-2 Main and Associated Audio Stream Information (Single-PID Mixing) 42
Figure 3-3 Associated Stream Monitor Control: Solo 42
Figure 3-4 Main Stream Monitor Status: Muted 42
Figure 3-5 Force Mixing with an Alternative Stream 43
Figure 3-6 Associated Audio Stream Information (Two Audio Packet Identifiers) 43

List of Tables

Table 1-1 Front-Panel LED Indicators 3
Table 1-2 Channel Name Abbreviations 6
Table A-1 Audio Frame Latency: AES, SDI, HDMI 47
Table A-2 Video Resolutions and Frame Rates 48
Table A-3 Specifications for SDI Output 48

Introduction

The Dolby® DP580 Professional Reference Decoder is the first reference Dolby TrueHD decoder, and serves all Dolby audio codecs, including Dolby Digital, Dolby Digital Plus™, HE AAC with metadata, Dolby TrueHD, Dolby E, and Dolby Pro Logic® II technologies. It also supports advanced Dolby technologies, such as associated audio mixing.

The DP580 provides a real-time reference tool for generating signals for Dolby TrueHD, Dolby Digital, and Dolby Digital Plus. It also enables validation of associated Metadata-enhanced Audio Transmission (MAT) encoded Dolby TrueHD signals. These features enable consumer and professional device manufacturers to use the DP580 to test the integration of Dolby technologies in their products.

The DP580 offers comprehensive monitoring and quality control (QC) through a web-based user interface that provides easy selection and monitoring for downmixing, listening, and compression modes. Front-panel controls also allow selective monitoring through standard headphones.

Extensive input capabilities allow broadcasters to perform QC at any point within their headend. This enables monitoring and display of all audio-related metadata as well as measuring program loudness, using Dolby Dialogue Intelligence™ technology with ITU-R BS.1770-1, ITU-R BS.1770-2, ITU-R BS.1770-3, and Leq(A) loudness estimation. The DP580 also supports EBU loudness.

Dialogue Intelligence features an advanced measurement technology capable of quantifying the subjective loudness of speech in broadcast programming. We developed this technology to analyze the input signal and make measurements only when dialogue is present. Quantifying the dialogue level simplifies a crucial step in broadcasting. When switching between programs, most home listeners adjust their television volume controls in an effort to achieve consistency in dialogue levels between programs. By properly monitoring the dialogue level, you can verify whether the Dolby dialogue level metadata parameter is accurate.

The DP580 provides these additional features:

- Monitoring capabilities for broadcaster QC set-top box (STB) labs
- A consumer emulation mode for Dolby Digital Plus and Dolby Pulse decoders found in consumer TVs and STBs, as well as H.264 and MPEG-2 video decoding
- High-Definition Multimedia Interface™ (HDMI™) 1.4a I/O compatibility
- HDMI Extended Display Identification Data (EDID) device emulation (emulates HDMI repeater/sink device: audio/video receiver [AVR], TV, STB)
- Error detection and information logging (pause burst, IEC 61937 data types, Consumer Electronics Control [CEC] message)
- HDMI Audio Return Channel (ARC) support
- HDMI pass-through mode

This chapter covers the following:

- DP580 Front Panel
- DP580 Rear Panel

1.1 DP580 Front and Rear Panels

This section describes the DP580 front- and rear-panel components.

1.1.1 DP580 Front Panel

The DP580 front panel includes the following components:

- Input LED
- Audio LED
- Video LED
- Error LED
- User-control screen
- Navigation keys
- Volume knob
- Headphone jack
- Dim button
- Over-temperature indicator
- Reset button
- Power button
- Two USB 2.0 ports

Following is a description of the DP580 front-panel components.

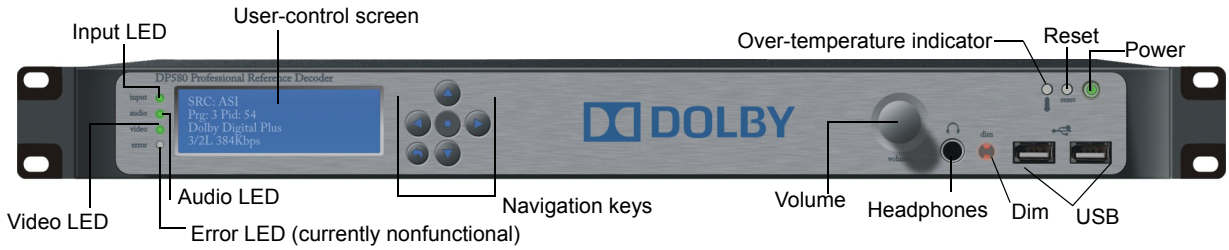


Figure 1-1 DP580 Front-Panel Components

Front-Panel LEDs

The color of each front-panel LED indicates the state of the selected input (see Table 1-1).

Table 1-1 Front-Panel LED Indicators

Input LED	Audio LED	Video LED
● Green: Valid data is detected on the selected input, and no errors occurred in past five seconds.	● Green: Audio data is detected on the selected input, and no errors occurred in past five seconds.	● Green: Video data is detected on the selected input, and no errors occurred in past five seconds.
◯ Off: No data is detected on the selected input.	◯ Off: No audio data is detected on the selected input.	◯ Off: No video data is detected on the selected input.
● Red: A cyclic redundancy check (CRC) error, transport error, or PA spacing error has occurred.	● Red: A CRC error has occurred, or sync is not found.	● Red: A video processing error has occurred.

User-Control Screen

Displays system status and allows a user to configure networking.

Navigation Keys

Provide up, down, left, right, escape, and enter functions for user-control screen menu navigation.

Volume Knob

Controls the headphone output, eight-channel analog output, and digital outputs, depending on the **Volume Control** setting, as described in Section 2.14.2.

Headphone Output

6.35 mm (1/4-inch) standard stereo headphone port.

Dim Button

Reduces the audio level by a configurable value. (Default is –20 dB.) You can configure this attenuation control through the **Monitoring** screen. When you press this button to activate the current dim setting, its LED illuminates in red.

Over-Temperature LED

This LED blinks in red when the CPU temperature approaches the maximum temperature specified by the manufacturer (or if an internal fan fails). If this occurs, verify that the ambient temperature is within the DP580 operating temperature limits (10°C to 35°C) and there is proper airflow to the DP580 front-panel vents. If the red LED blinks in red because an internal fan fails, the other fans operate at their highest speed, which is audible.

Reset Switch

Restarts the hardware without cycling power. Use this button if you cannot shut down the system using the power button.

Power Button

To power up the system, press this button for one second and then release it. It takes approximately one minute for the unit to boot up. To properly shut down the system, always use the power button. Press this button for one second and then release it. The user-control screen displays a message indicating that the unit is shutting down. It takes approximately ten seconds for the unit to shut down properly.

1.1.2 DP580 Rear Panel

The DP580 rear panel includes the following components:

- AC power connector
- **AES IN** port
- Four **AES OUT** ports
- Multichannel analog out
- Gigabit Ethernet port (**COMMAND**)
- Gigabit Ethernet port (**MEDIA**)
- **ASI/SDI IN** port
- **SDI OUT** port
- **HDMI IN** port
- **HDMI OUT** port
- Two USB 2.0 ports

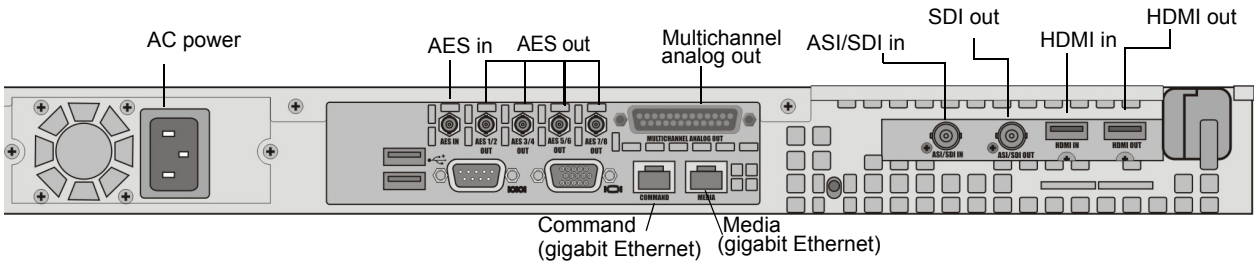


Figure 1-2 DP580 Rear Panel

Following is a description of the functional DP580 rear-panel inputs and outputs.

AES In

Receives PCM, Dolby Digital, Dolby E, Dolby Digital Plus, AAC, HE AAC, and HE AAC v2 signals. The system recognizes each signal type and processes the signal appropriately. This input is an unbalanced 75Ω female high-density BNC connector per AES-3id-1995 (SMPTE 276M).

AES Out

Outputs PCM or coded audio streams through four unbalanced, 75Ω female high-density BNC connectors. Signal levels per AES-3id-1995 (SMPTE 276M). The output type depends on the **Output Configuration** setting, as described in Output Configuration.

ASI/SDI In

Autodetects the incoming signal as either ASI or SDI. Supports embedded audio/video via SD-SDI (SMPTE 259M-1998), 1.5 Gbps HD-SDI (SMPTE 292M-1998), or 3 Gbps HD-SDI (SMPTE 424M-2006), or as part of an MPEG transport stream via DVB-ASI (ETSI TR 101 891 v1.1.1).

Command Port (Gigabit Ethernet)

Connects a network to administer the unit through a PC web-based user interface.

HDMI In

Receives uncompressed video, and uncompressed or compressed audio.

HDMI Out

Sends uncompressed video, and uncompressed or compressed audio.

Media Port (Gigabit Ethernet)

Connects a network to receive MPEG transport streams over User Datagram Protocol (UDP) and Real-time Transport Protocol (RTP).

Multichannel Analog Out

Requires a male 25-pin D-connector that is compliant to the TASCAM® pinout standard.

SDI Out

Outputs PCM, Dolby Digital, and Dolby Digital Plus audio, as well as video, in one of eight embedded channel pairs.

Channel Abbreviations

The channel name abbreviations used throughout this document are listed in Table 1-2.

Table 1-2 Channel Name Abbreviations

Abbreviation	Channel Name
L	Left
C	Center
R	Right
Ls	Left Surround
Rs	Right Surround
LFE	Low-Frequency Effects
Bsl	Back Surround Left
Bsr	Back Surround Right
Lb	Left Back
Cb	Center Back
Rb	Right Back

Send Us Your Feedback

If you have a question or a comment regarding this manual, send us an email.

Using the DP580

This chapter shows you how to use the Dolby® DP580 Professional Reference Decoder. It covers the following:

- Installing the Hardware
- Configuring the Network Settings
- Connecting to the DP580
- Exploring the Web Client User Interface
- Monitoring IP Input
- Monitoring AES Input
- Monitoring ASI/SDI Input
- Monitoring HDMI Input
- Generating Media Files
- Monitoring HDMI Audio Return Channel Receiver Input
- Checking the Loudness Status
- Modifying the Processing Configuration
- Configuring Loudness Measurement
- Modifying the Output Configuration
- Modifying the Network Settings
- Using the Administrative Controls
- Resetting Factory Defaults from the User-Control Screen

2.1 Installing the Hardware

To install the DP580:

1. Rack mount the DP580 in a 1-U rackspace. The DP580 measures 44 × 483 × 394 mm (1.75 × 19 × 15.5 inches), so the rack must be at least 16 inches deep.

Caution: To ensure proper ventilation, do not block the front-panel ventilation area (above the Dolby logo).

2. Connect your video outputs and inputs:
   HDMI
   - Connect one end of an HDMI™ cable to the DP580 **HDMI OUT** port. Then connect the other end of the cable to the HDMI input on a compatible receiving device.
   - Connect one end of an HDMI cable to the DP580 **HDMI IN** port. Then connect the other end of the cable to the **HDMI** output on a compatible source device.

   ASI/SDI
   - Connect one end of an ASI/SDI cable to the DP580 **ASI/SDI IN** port, and connect the other end of the cable to a compatible output device.
3. Connect your audio inputs and outputs:
   Digital Audio
   - Connect one end of a high-density BNC cable to the **AES IN** port. Then connect the other end of the cable to the standard BNC cable attached to your external digital audio outputs.
   - Connect one end of a high-density BNC cable to each of the four **AES OUT** ports. Then connect the other end of the cables to a standard BNC cable attached to your external digital audio inputs.

Note: Dolby provides a high-density BNC cable.

   Analog Audio
   - Connect the 25-pin D-connector of the breakout cable to the DP580 **ANALOG OUT** port. Then connect each of the eight analog connectors (for example, XLR or TRS) on the other end of the breakout cable to your external analog audio input.

Note: To connect your audio output, use a 25-pin D-connector cable with a TASCAM® standard pinout.

4. Connect the provided power cable to the AC connector.

2.1.1 Connecting the Multichannel Analog Output

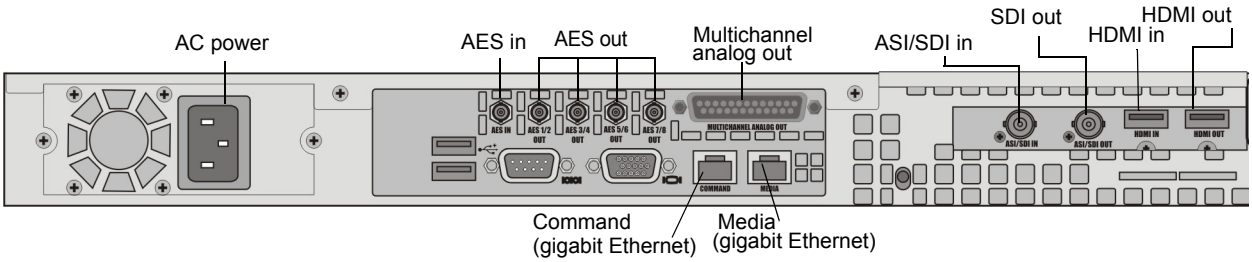
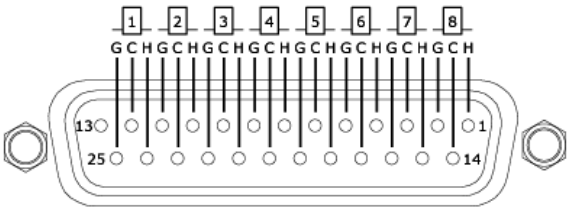


Figure 2-1 DP580 Rear Panel

To output multichannel analog audio, use a 25-pin D-connector cable. The DP580 uses the TASCAM pinout standard. The DP580 maps the audio channels to the multichannel analog output.

Note: Dolby does not provide this cable. You must purchase the TASCAM 25-pin D-connector analog breakout cable.



Channel	L	R	C	LFE	Ls	Rs	Bsl	Bsr
Pinout	1	2	3	4	5	6	7	8

Figure 2-2 25-Pin D-Connector Pinout

2.1.2 Starting Up the System

To start up the system, press and release the power button. The unit starts up in approximately one minute, and when the boot process is complete, the user-control screen displays the following:

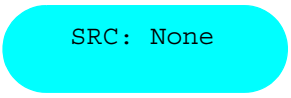


Figure 2-3 User-Control Screen After Startup

2.2 Configuring the Network Settings

The DP580 uses two network connections. The **COMMAND** port connects to your management network through a web browser, and the **MEDIA** port connects directly to your media network. By default, the **COMMAND** port IP address is 192.168.1.2 and the **MEDIA** port is 192.168.2.2. To configure these ports, use the front-panel navigation keys (see Figure 2-4).

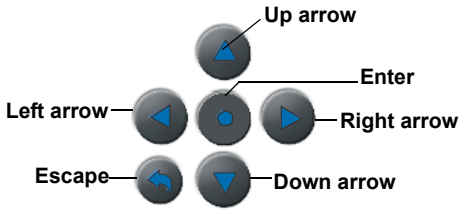


Figure 2-4 Front-Panel Navigation Keys

To configure the **COMMAND** port:

1. Press the escape key.
   The **DP580** menu is displayed.
2. Press the enter key three times to display the **IP Settings** menu.
   Two options are displayed: **Command Interface** and **Media Interface**.
3. Press the right arrow to display the **Network Mode** menu for the **Command Interface**.
4. Press the right arrow twice to display **Static**, press the down arrow to select **Apply, and then press enter.**
5. Press the down arrow to select **Static IP Settings**, then press enter to activate the corresponding field.
6. Use the arrow keys to enter a static IP address, then press enter.
7. Repeat steps 5 and 6 for the **Netmask** and **Gateway**, select **Apply**, then press enter.
8. Press the down arrow to select **Host Name**, then press enter.
   The **Host Name** menu is displayed.
9. Press enter to activate the **Host Name** field.
10. Use the arrow keys to enter a host name, select **Apply**, then press enter.

To configure the **MEDIA** port:

1. Press the escape key until you return to the **IP Settings** menu.
2. Press the down arrow key to select **Media Interface**.
3. Repeat steps 4–10 in the previous procedure (for the **COMMAND** port) to configure the **MEDIA** port.

Note: After starting up the system and configuring the network settings, you can use your web browser to perform most DP580 functions, as described in the following sections. This includes network settings management, as shown in Figure 2-5.

2.3 Connecting to the DP580

You connect to the DP580 through your management network using a web browser. Currently, the DP580 is compatible with Mozilla® Firefox® 3.5 or later, Google™ Chrome™ 5.0 or later, and Microsoft® Internet Explorer® 8.0 or later. Internet Explorer, in particular, provides limited functionality; for example, the signal meters have a reduced update level rate and the graphics are different.

Open your browser, and type the DP580 IP address into the URL bar (for example, **http://192.168.1.2**). The DP580 web client **Input** screen is displayed, as shown in Figure 2-5 for a standard transport stream.

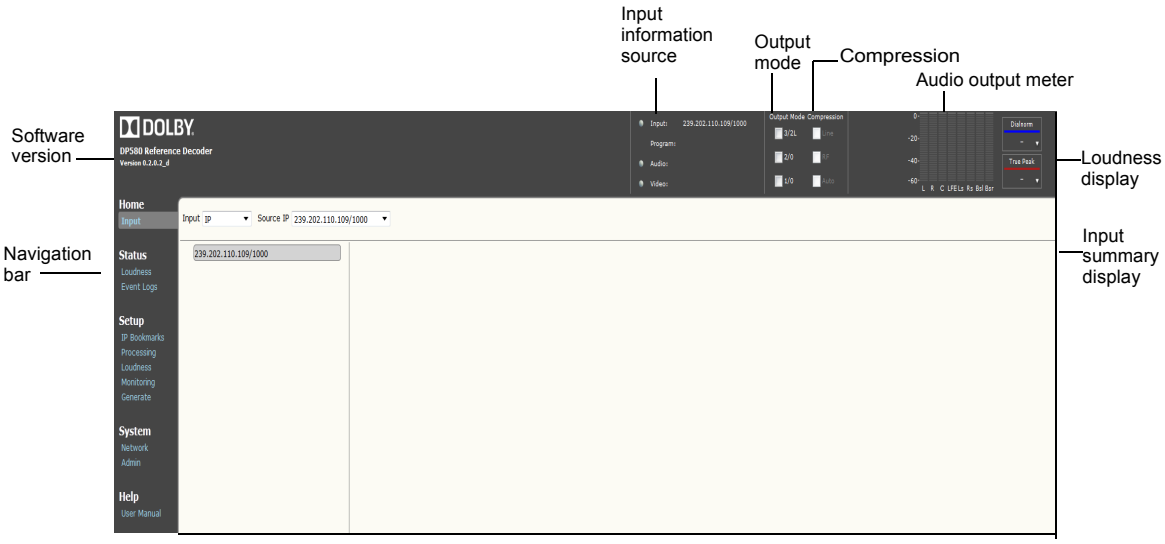


Figure 2-5 DP580 Web Client Input Screen

2.4 Exploring the Web Client User Interface

Following is a description of the web client user interface.

2.4.1 Navigation Bar

The DP580 navigation bar provides access to all of the DP580 status and setup screens (and the user manual). Click in the desired menu to display the corresponding screen.

Figure 2-6 Navigation Bar

2.4.2 DP580 Display Bar

Figure 2-7 shows the DP580 display bar. This bar provides the following:

- Input Source Display
- Output Mode and Compression Controls
- Audio Output Meter
- Loudness Displays

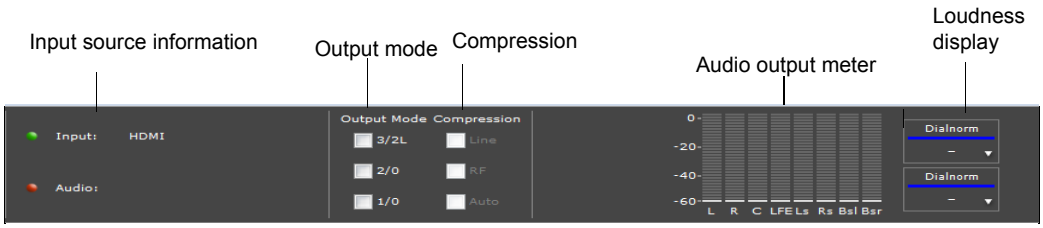


Figure 2-7 DP580 Display Bar

2.4.3 Input Source Display

This display shows the current input source (for example, IP, SDI, or AES), and the selected program, audio, and video streams.

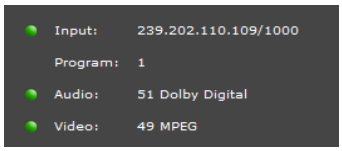


Figure 2-8 Input Source Display

2.4.4 Output Mode and Compression Controls

This display shows the current output mode and compression modes, which you can modify by checking and unchecking the respective boxes.

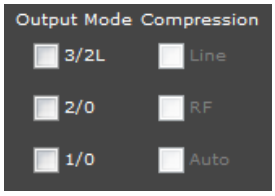


Figure 2-9 Output Mode and Compression Display

2.4.5 Audio Output Meter

This meter shows the audio levels for each output channel.

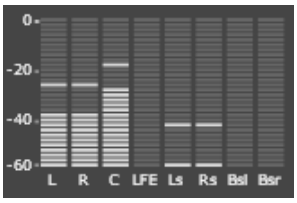


Figure 2-10 Audio Output Meter

2.4.6 Loudness Displays

These display boxes at the upper-right corner of the screen show the current values for specific loudness parameters. You can change the currently displayed loudness parameter by clicking the small triangle at the lower-right corner of each box, as shown in Figure 2-11. For more details on the loudness parameters, see Loudness Parameters.

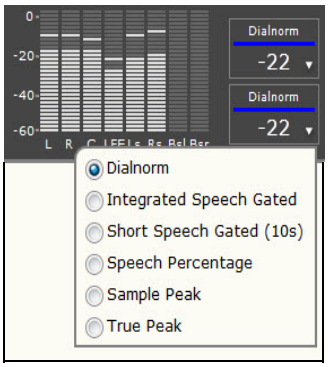


Figure 2-11 Loudness Display Menu

2.5 Monitoring IP Input

To ingest MPEG transport streams (using UDP and RTP) over IP:

1. Select **IP Bookmarks** in the **Setup** menu at the left side of the **Input** screen.

   The **IP Bookmarks** screen is displayed. In this screen, you can save bookmarks for the desired IP input sources.

2. To add an input source:
   - Click in the **Name** field, and then enter a name for your media source.
   - Click on the **Mode** menu, and then select a mode (**Multicast** or **Unicast**).
   - For **Multicast**, click on the **Multicast Group** field, and then enter the appropriate multicast group address, if required.
   - For **Multicast**, click on the **IGMPv3 Source IP** field, and then enter the IP address of the source device, if required.
   - Click on the **Port** field, and then enter a port for your source.
   - Click **Save**.
3. Repeat step 2 for each input source you want to add.

   After you save one or more input sources, your entries are displayed in the **Bookmarks** list. You can double-click a bookmark to monitor an input source.

4. Select **Input** in the **Home** menu.

   The **Input** screen is displayed, in which you can select **IP** in the **Input** drop-down menu, as shown in Figure 2-12.

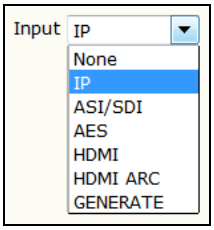


Figure 2-12 Select IP as the Input

After you select **IP** as the input, the **Source IP** menu is displayed, in which you can select the desired IP source.

5. Select an IP source in the **Source IP** menu.

   The system monitors the first program in the transport stream and displays the corresponding metadata, a list of all included program streams, the packet identifier (PID) for each program, and the audio and video types contained in each packet, as shown in the examples in Figure 2-13 (for a standard transport stream).

   At the top of the screen, the system displays the input source, program, audio, and video information. The compression meter and the audio output meter are now active.

   The system also identifies the input source on the front-panel user-control screen.

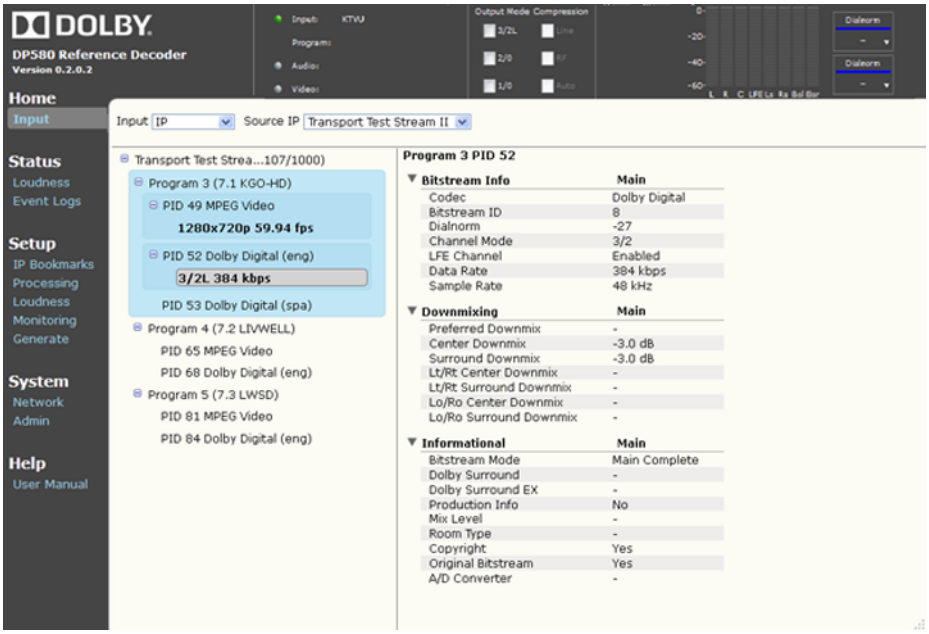


Figure 2-13 Source IP Information (Transport Stream with Metadata)

6. To use the **Output Mode** and **Compression** options, check the respective boxes.
7. To monitor another PID, double-click on it at the left side of the screen.
8. To monitor another program in a standard transport stream, double-click on it at the left side of the screen.
9. To monitor a single program in a Dolby E transport stream, click the **Monitor** field at the right side of the screen and select the desired program in the drop-down menu, as shown in Figure 2-14. (For a description of Dolby E metadata emulation and instructions on enabling this setting, see Dolby E Configuration.)
10. If you connected the DP580 HDMI output to a compatible receiving device, the audio plays on the receiver speakers and the video is displayed on the receiver screen.

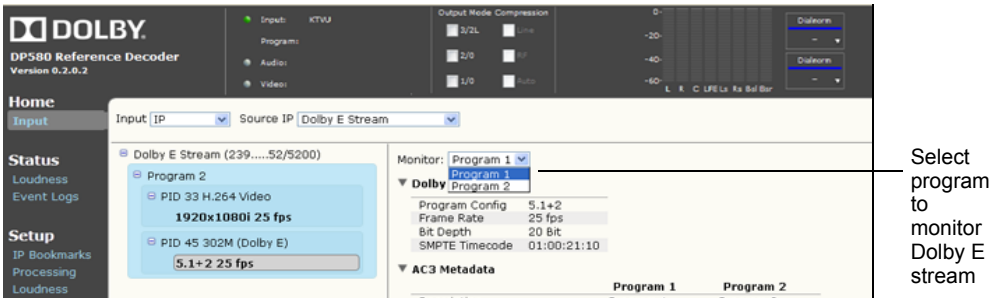


Figure 2-14 Source IP Information (Dolby E Transport Stream with Metadata)

2.6 Monitoring AES Input

To stream media over AES:

1. Select **Input** in the **Home** menu.
   The **Input** screen is displayed.
2. Select **AES** in the **Input** drop-down menu.

The system displays information for the current AES input source. To monitor a single program in a Dolby E transport stream, click the **Monitor** field at the right side of the screen and select the desired program in the drop-down menu. (For a description of Dolby E metadata emulation and instructions on enabling this setting, see Dolby E Configuration.)

The compression meter and the audio output meter are now active.

The system also identifies the AES source on the front-panel user-control screen.

3. To use the **Output Mode** and **Compression** options, check the respective boxes.

2.7 Monitoring ASI/SDI Input

The system automatically detects the input as ASI or SDI, and then displays information for the current input source. To monitor a single program in a Dolby E transport stream, click the **Monitor** field at the right side of the screen and then select the desired program in the drop-down menu. (For a description of Dolby E metadata emulation and instructions on enabling this setting, see Dolby E Configuration.)

The system also identifies the ASI/SDI source on the front-panel user-control screen.

To use the **Output Mode** and **Compression** options, check the respective boxes.

2.8 Monitoring HDMI Input

To monitor HDMI input:

1. Select **Input** in the **Home** menu.
   The **Input** screen is displayed.
2. Select HDMI in the **Input** drop-down menu.
   The system displays information for the current input source, as shown in Figure 2-15 for an HDMI input source.

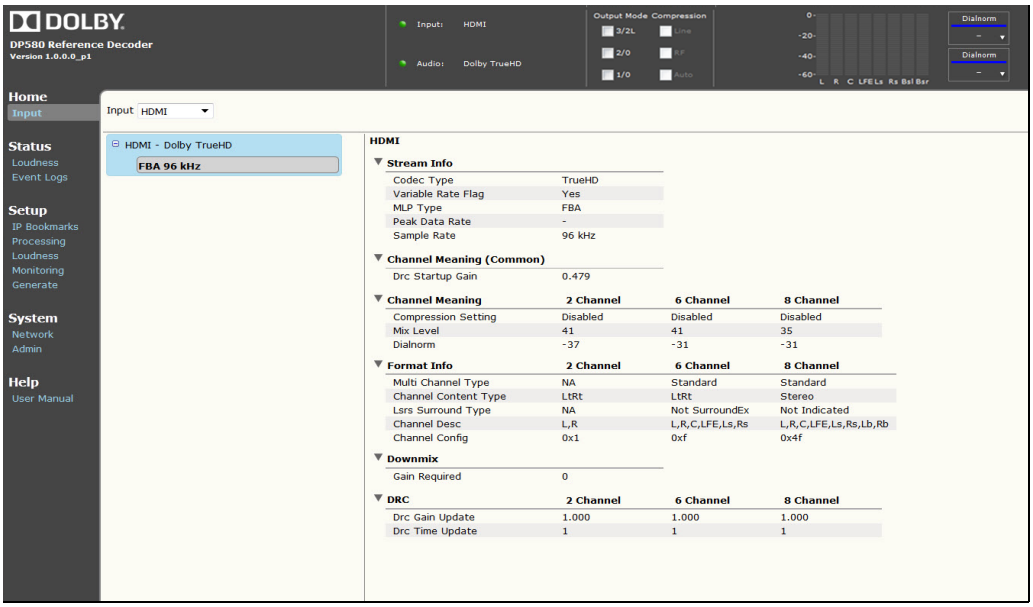


Figure 2-15 HDMI Input Source (Dolby TrueHD)

2.9 Generating Media Files

You can generate and play the following types of files using the DP580:

- Dolby TrueHD
- Dolby Digital Plus™
- Dolby Digital
- Dolby playlist

2.9.1 Playing Media Files

To play media files:

1. Select **Input** from the **Home** menu.
   The **Input** screen is displayed.
2. Select **GENERATE** from the **Input** drop-down menu.
3. Select **Generate** from the **Setup** menu.

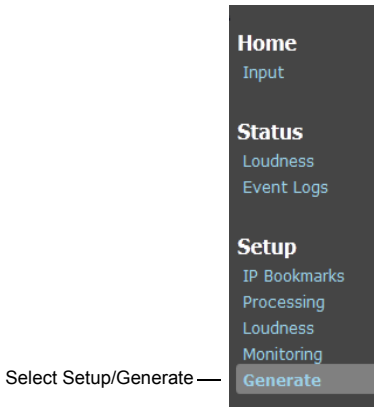


Figure 2-16 Setup/Generate Menu

The **Stream Generation Configuration** screen is displayed.

4. Select the type of media file you want to generate individually or in combination: Dolby TrueHD, Dolby Digital Plus, or Dolby Digital.

   The **File Filter** option, shown in Figure 2-17, enables you to view only the files types you select. Use the file field drop-down menu to retrieve the file from a collection of streams located internally in the DP580.

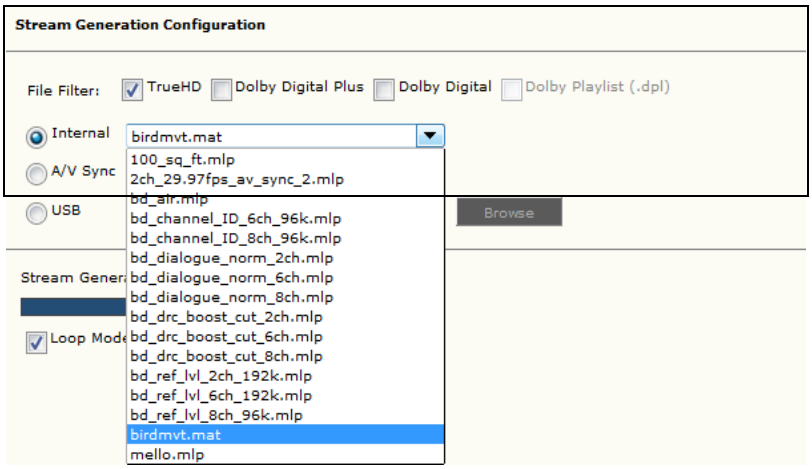


Figure 2-17 File Filters and File Selection Menu

2.9.2 Generating A/V Sync Files

Selecting the **A/V Sync** button in the **Stream Generation Configuration** options enables Dolby TrueHD, Dolby Digital Plus, or Dolby Digital flash pop file streaming.

2.9.3 Streaming External Files

To stream external files:

1. Connect a USB device that hosts your media files.
2. Choose the **USB** option, and then browse for the file you want from the media streams on the USB device. See Figure 2-18.

The DP580 supports the following audio streams from USB:

- .ac3
- .ec3
- .vr
- .mlp

Figure 2-18 Internal and External Files

You can also select and play a series of files from a Dolby playlist file on the USB device. When you select the playlist file, the DP580 streams the individual files in sequence. To set up a playlist file:

- All files you want to stream must use the .ac3, .3c3, .vr, or .mlp formats.
- The playlist must be a text file with the individual file names separated by semicolons.
- The individual files, with a .dpl extension, must reside in the same location as the playlist file.

After you create and load the playlist file on the USB device, you can play the file by selecting it in the same way as any other file on the device.

Figure 2-19 shows the **Stream Generation Control** option. This feature displays the playback progress of the file. You can select **Loop Mode** to play back the file in Loop mode. Click the **Start** and **Stop** buttons to start and stop the playback.

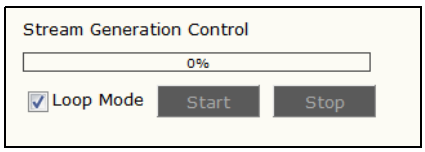


Figure 2-19 Stream Generation Control

2.9.4 Monitoring HDMI Audio Return Channel Transmitter Output

If you have an HDMI device that supports ARC reception connected to the DP580 for file generation, the generated content is transmitted through the designated outputs, and is also transmitted back through the ARC transmitter to the HDMI device connected to the DP580 HDMI input.

You must enable ARC transmission by selecting an ARC output format under **Output Configuration**, as shown in Figure 2-20.

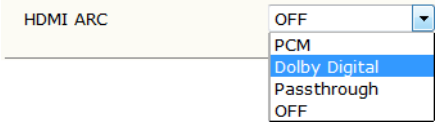


Figure 2-20 HDMI ARC Selection

2.10 Monitoring HDMI Audio Return Channel Receiver Input

The **ARC** receiver feature connects the HDMI output to a TV HDMI input that supports ARC transmission.

To monitor **ARC** receiver input:

1. Select **Input** in the **Home** menu.
   The **Input** screen is displayed.

2. Select **HDMI ARC** in the **Input** drop-down menu.
   The system displays information for the current ARC receiver input source, as shown in Figure 2-21.

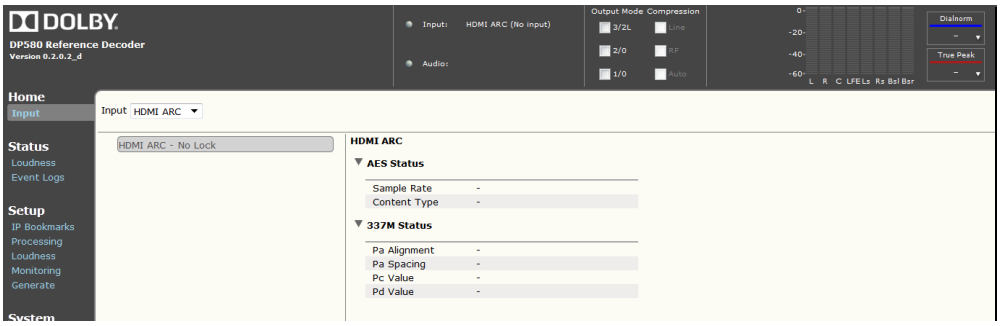


Figure 2-21 Select ARC Receiver Input Source (Dolby Digital with Metadata)

   The system also identifies the ARC receiver source on the front-panel user-control screen.

3. To use the **Output Mode** and **Compression** options, check the respective boxes.

2.11 Checking the Loudness Status

The DP580 continuously measures the subjective loudness of audio programs. The system measures loudness using multiple methods, as described in Loudness Parameters**.**

To check the loudness status, select **Loudness** in the **Status** menu.

The Loudness screen is displayed for the selected input source, as shown in Figure 2-22.

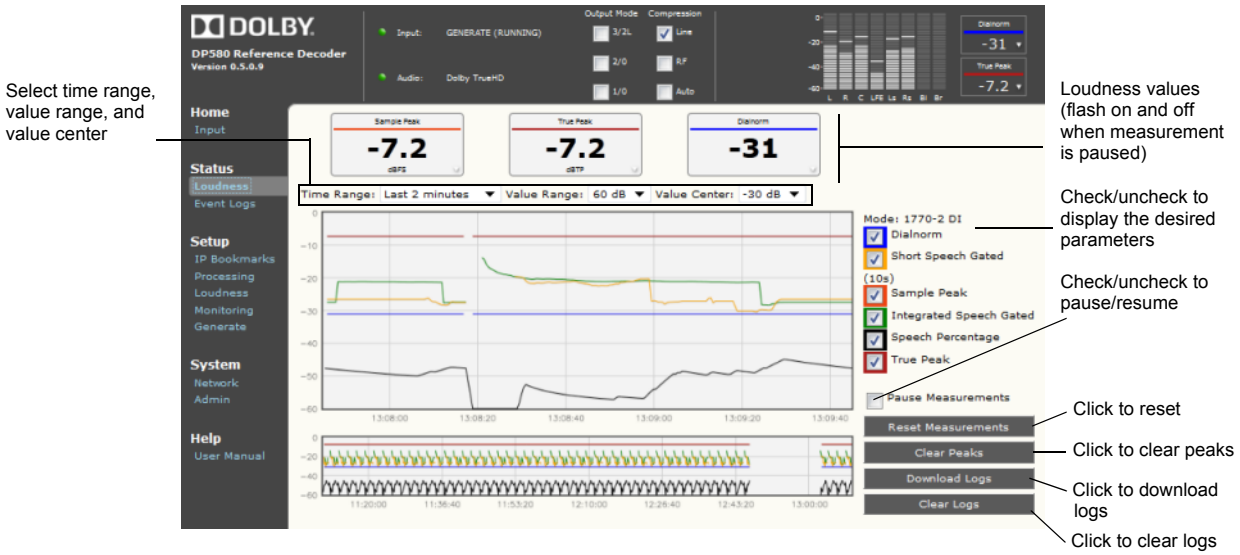


Figure 2-22 Loudness Screen

In this screen, you can perform the following functions:

- Display the loudness status for a specific time range, value range, and value center by clicking in the corresponding field and selecting an option in the respective drop-down menu
- Plot the desired parameters by checking the corresponding boxes at the right side of the graph
- Change the displayed loudness parameters
- Select a period of time (by dragging a mouse across the loudness graph) to display only the selected period of time without updating the current graph measurements

In addition, if you have selected the short-term (10 s) ungated mode, the screen provides a color-coded system in the values boxes to show loudness gap information, as follows:

- If the difference between short-term ungated mode and `dialnorm` is less than two, the bar in the value box is blue, which indicates good performance.
- If the difference is greater than two, but less than four, the bar is yellow, which indicates a warning.
- If the difference is greater than four, the bar is red, which indicates an error.

You can see examples of the color indicators in Figure 2-22.

2.11.1 Changing the Loudness Display

To change the displayed loudness parameter in any of the three loudness value boxes (located above the graph), click the small triangle at the lower-right corner of a box, as shown in Figure 2-23. A drop-down menu is displayed, in which you can select a loudness parameter. The loudness value for the selected parameter is displayed in the display box.

Figure 2-23 Select Loudness Parameter

In the **Loudness** screen (see Figure 2-22), you can also:

- Reset all loudness measurements by clicking **Reset Measurements**.
- Pause all loudness measurements by checking the **Pause Measurements** box. (Loudness values flash on and off.) To resume measurements, uncheck this box. When the measurement process resumes, the system compares the current loudness values to the previous loudness values (before the measurement was paused). If the before and after values are the same, the measurement resumes; if the before and after values are different, the measurement process resets (begins a new measurement). The measurement process also resets if the **Channel Mode**, **Sample Rate**, or **LFE** stream properties change.
- Download or clear loudness logs.
- Clear all peaks by clicking **Clear Peaks**.

2.11.2 Downloading Loudness Logs

Note: To display the loudness status for another input source, select **Home** > **Input**, select the desired input source, and then select **Status** > **Loudness**.

The DP580 maintains a two-week database of loudness measurements at a half-second resolution. You can export these measurements as a comma-separated value (.csv file extension) for a specific source and a date and time interval. To download loudness logs:

1. Click **Download Logs** in the **Loudness** screen.

   The **Download Loudness Logs** screen is displayed, as shown in Figure 2-24.

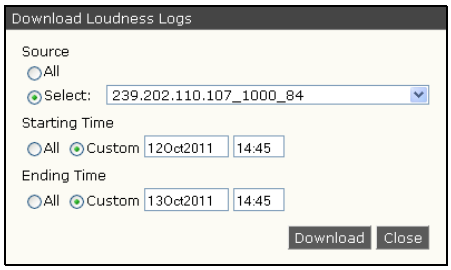


Figure 2-24 Download Loudness Logs Screen

2. For every source, click **All**, then click **Download**.
3. For a specific source, click **Select**, select the source, then click **Download**.

4. For every date and time, click **All** for the **Starting Time** and **Ending Time**, then click **Download**.
5. For a specific time range, click **Custom** for the **Starting Time** and **Ending Time**, enter a starting and ending date and time, then click **Download**.
6. To delete all the loudness logs, click **Clear Logs** in the **Loudness** screen, as shown in Figure 2-22**.**

2.11.3 Loudness Parameters

Following are descriptions for the DP580 loudness parameters.

dialnorm

The dialogue normalization metadata parameter, as contained within the input bitstream.

Sample Peak

The instantaneous digital signal level.

True Peak

The 4× oversampled peak value, as calculated per ITU-R BS.1770 Annex 2.

Integrated Measurement

Integrated, Level Gated

A gated integrated measurement.

Integrated, Speech-Gated

A Dolby Dialogue Intelligence™ gated, integrated measurement.

Integrated Ungated

An ungated integrated measurement.

Short-Term (10 s) Measurements

Short-Term Ungated

An ungated ten-second sliding window measurement.

Short-Term Speech Gated

A Dialogue Intelligence gated ten-second sliding window measurement.

Short-Term 3 s Ungated

A three-second sliding window measurement, as per EBU Tech 3341.

Maximum Momentary

A 400 ms sliding window measurement, as per EBU Tech 3341.

Loudness Range

The EBU Loudness Range descriptor, as per EBU Tech 3341 (not plotted in the graph view).

Note: All measurements, except for **Short Term 3 s Ungated**, **Maximum Momentary**, and **Loudness Range** are based on ITU-R BS.1770-1, ITU-R BS.1770-2, ITU-R BS.1770-3, and Leq(A). **Short Term 3 s Ungated**, **Maximum Momentary**, and **Loudness Range** are based on EBU.

2.11.4 Checking the Event Logs

The event logs display information regarding the incoming signal and the system. To check the event logs status, select **Event Logs** in the **Status** menu.

The **Event Logs** screen is displayed. You can filter the logs by **Level**, **Category**, and **Start time**/**End time** by clicking the respective area and making the desired selection, or by clicking **Show All** to remove all filters. In addition, you can download a .zip file by clicking **Download** or clear the list of events by clicking **Clear Events.**

When you click the **Level** field, the corresponding drop-down menu is displayed, in which you can select the user log display level, as shown in Figure 2-25.

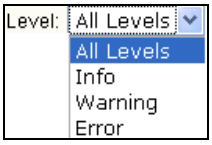


Figure 2-25 Level Menu

Category

When you click the **Category** field, the corresponding drop-down menu is displayed, in which you can select the user log display category, as shown in Figure 2-26.

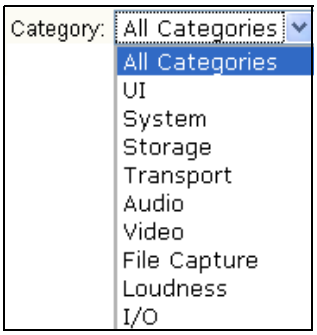


Figure 2-26 Category Menu

Start Time/End Time

When you click the **Start time or End time** field, two options appear: **All** and **Custom. All** specifies a log for all time frames. **Custom** activates the date and time fields, where you can select a specific time frame. Click the ✔ to display the specified log. If you click the ✖, the system displays all time frames (same as **All**).

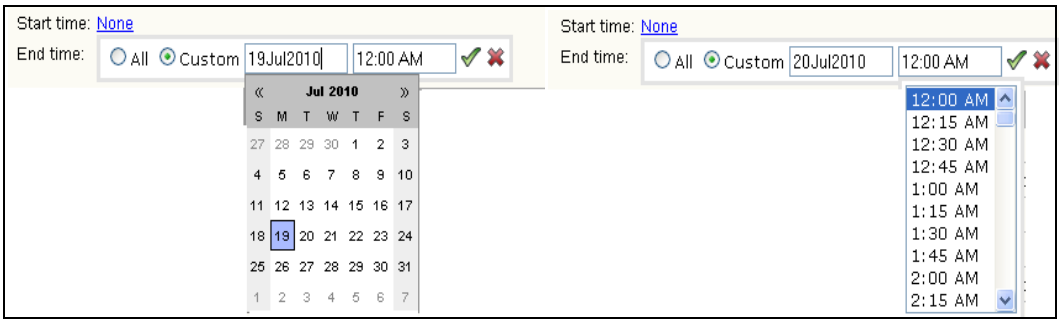


Figure 2-27 Start Time/End Time Fields

2.12 Modifying the Processing Configuration

The **processing** configuration controls the DP580 audio processing operation. To modify the processing settings:

- Select **Processing** in the **Setup** menu.

  The **Processing** screen is displayed. In this screen, you can change the current audio processing settings.

2.12.1 Decoder Configuration

Within the **Decoder Configuration** field, you can specify the decoding modes for each of the DP580 decoders (Dolby Digital, Dolby Digital Plus, AAC and HE AAC, Dolby Pro Logic® II, and Dolby Pro Logic IIx). However, some of the decoding modes apply only to the appropriate decoders.

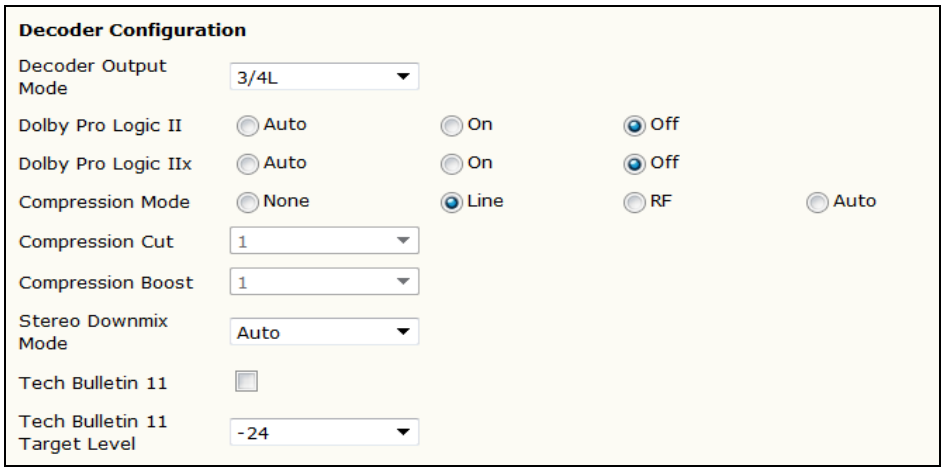


Figure 2-28 Decoder Configuration Options

Decoder Output Mode

The system provides four decoder output options:

- 1/0: Mono output
- 2/0: Stereo output
- 3/2L: 5.1 output
- 3/4L: 7.1 output

Note: For a Dolby Digital, Dolby Digital Plus, AAC, HE AAC, or Dolby E stereo downmix, the Decoder Output Mode also applies the selected option in the Stereo Downmix Mode menu.

Pro Logic II

Pro Logic II specifies the mode for the Dolby Pro Logic II decoder.

Auto performs Dolby Pro Logic II decoding based on the `Dolby Surround Mode` flag in the input bitstream.

On always performs Dolby Pro Logic II decoding if the incoming signal is stereo (`acmod` of 2/0).

Off disables Dolby Pro Logic II decoding.

Pro Logic IIx

Pro Logic IIx specifies the mode for the Dolby Pro Logic IIx decoder.

Auto performs Dolby Pro Logic IIx decoding based on the `Dolby Surround EX` flag in the input bitstream.

On always performs Dolby Pro Logic IIx decoding if the incoming signal is 5.1 (`acmod` of 3/2).

Off disables Dolby Pro Logic IIx decoding.

Compression Mode

Compression Mode provides four options: **None**, **Line**, **RF**, and **Auto**.

You can enable a compression option only when the unit is decoding a Dolby signal.

RF applies the strongest compression profile available, equivalent to an RF connection to a TV set or small speakers.

Line applies what some consumer decoders call light compression; this is usually the default setting for DVD players and STBs. In this mode, you can control the compression **Cut** and **Boost** settings.

With the exception of Dolby TrueHD, **Auto** mode scales the **Line** mode profile, based on the **Compression Cut** and **Compression Boost** settings. **Auto** is a separate mode for Dolby TrueHD, in which the compression settings are based on the metadata.

None applies only the dialogue normalization parameter (`dialnorm`), but no dynamic range compression.

Note: When downmixing, the DP580 automatically applies enough compression at peak moments to prevent signal overload, even when a compression mode is not selected.

Compression Mode Line Settings

The **Line** mode compression settings define cut and boost scaling factors when the **Compression Mode** is set to **Line**. When downmixing, any scaling defined for the cut factor is ignored, and the system applies the full cut dynamic range compression. The factory setting for **Line** is 0. At that setting, selecting **Line** turns dynamic range compression off.

To customize your compression settings:

- Click **Line** for **Compression Mode**.

  The **Compression Cut** and **Compression Boost** fields are now active. When you click on either of these fields, the corresponding drop-down menu is displayed, as shown in Figure 2-29 for **Compression Cut**. Both of these drop-down menus display the same options.

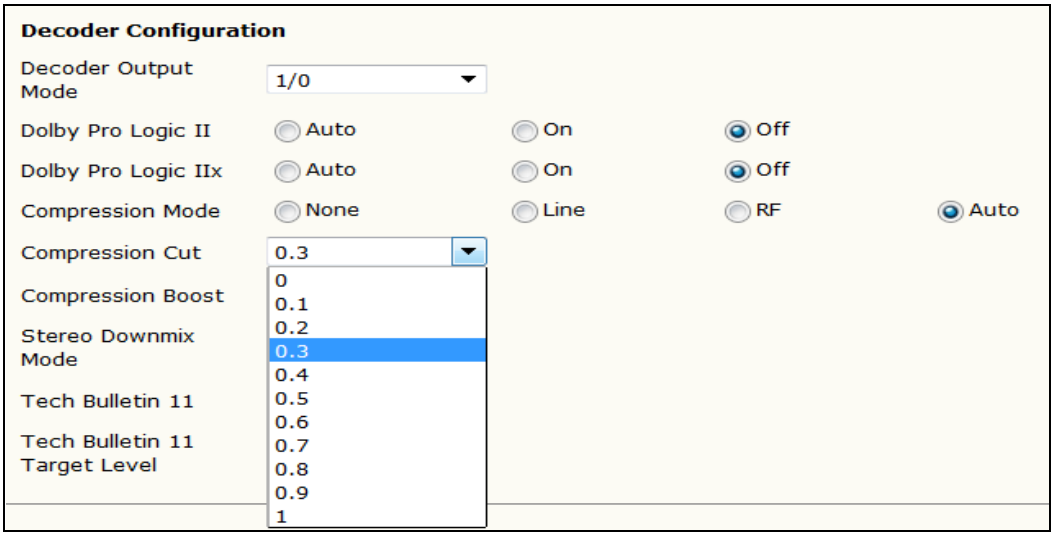


Figure 2-29 Line Cut Menu

Stereo Downmix Mode

Stereo Downmix Mode specifies how the Dolby Digital, Dolby Digital Plus, AAC,HE AAC, and Dolby E decoders perform stereo downmixing when the **Decoder Output mode is set to 2/0**. When you click the **Stereo Downmix Mode** field, a drop-down menu is displayed, in which you can select from three stereo downmixing options: **Auto**, **LtRt**, or **LoRo**.

Following is a description of each **Stereo Downmix Mode** option:

- **Auto** follows the preferred downmixing instructions specified in the bitstream metadata.
- **Lt/Rt** produces an output compatible with Dolby Surround Pro Logic decoding. It is a two-channel signal that is similar to a program encoded as Dolby Surround. A properly encoded Dolby Digital program includes metadata that controls downmix delivery, so if a user has a Dolby Pro Logic system, but not Dolby Digital, the program plays back taking full advantage of Dolby Pro Logic. Program metadata also customizes downmix delivery for a stereo system. **Lt/Rt** enables the Dolby Pro Logic decoder to convert a two-channel downmixed stream back to its original configuration (for example, back to Dolby Digital 5.1).
- **Lo/Ro** outputs only two channels (for example, a headphone output stream), but with this type of downmix you cannot convert the stream back to 5.1. We recommend that program mixers designate Lo/Ro as the source for mono downmixes. However, a mono output of the Lt/Rt mix is also possible.
- For correct emulation of consumer products, the LFE channel is discarded in **Lt/Rt** and **Lo/Ro** downmixing modes, except when LFE mix level metadata is present in the content.

Note: Both **Lt/Rt** and **Lo/Ro** output to the Left and Right channels. If you apply Dolby Pro Logic decoding, the decoded output is sent to Left, Right, Center, and a mono surround channel output, which is then sent to both the Left surround and Right surround outputs to feed both surround speakers.

Tech Bulletin 11

Check this box if you want to reconcile the loudness level differences between MPEG-1 LII and Dolby Digital Plus audio.

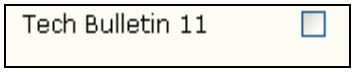


Figure 2-30 Tech Bulletin 11 Option

Tech Bulletin 11 Target Level

Select the desired loudness level in the **Tech Bulletin 11 Target Level** menu.

2.12.2 Dolby TrueHD

This configuration enables you to turn off `dialnorm` and dynamic range control (DRC) by unchecking the box.

2.12.3 Dolby Digital and Dolby Digital Plus Configuration

This **configuration** provides **Associated Audio Mixing**, **Error Concealment**, and **MS10 Emulation** parameters, as shown in Figure 2-31.

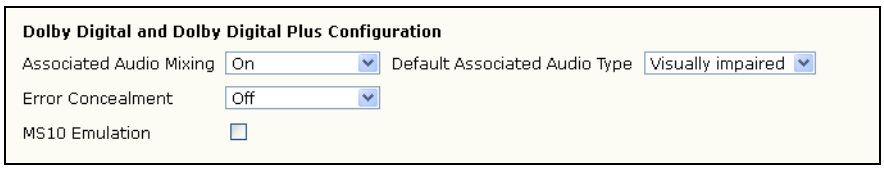


Figure 2-31 Dolby Digital and Dolby Digital Plus Configuration Parameters

Dolby Digital Plus Associated Audio Mixing

A Dolby Digital Plus input may include one or more (maximum of seven) associated audio streams. The Dolby Digital Plus decoder can mix the main audio stream with any available associated audio stream, as specified for Digital Video Broadcasting in Annex E of ETSI TS 101 154.

When you click the **Associated Audio Mixing** field, the corresponding drop-down menu is displayed, allowing you to turn this option on or off, as shown in Figure 2-32. The Dolby Digital Plus metadata specifies the audio level when you enable associated audio mixing.

When you click the **Default Associated Audio Type** field, the corresponding drop-down menu is displayed with seven options, as shown in Figure 2-32. In this menu, you can specify which audio stream you want to mix with the main audio stream.

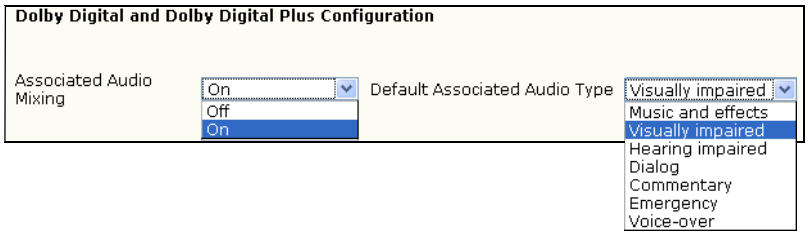


Figure 2-32 Associated Audio Mixing Menus

For complete details on associated audio mixing, see Chapter 3.

Error Concealment

When you click the **Error Concealment** field, the corresponding drop-down menu is displayed with two options. If you select **On**, the system repeats the previous frame up to four times when a stream error occurs. If you select **Off**, the system mutes the current frame when a stream error occurs.

Dolby Digital Plus MS10 Emulation

Check this box if you want the Dolby Digital Plus decoder to emulate a Dolby MS10 Multistream Decoder. This function sets the **Stereo Downmix** mode to **Lo/Ro**.

2.12.4 Dolby E Configuration

The **Dolby E Configuration** field provides **Metadata Emulation** and **Dolby E Latency Mode** parameters.

Metadata Emulation

Check this box if you want the Dolby E decoder to apply the metadata parameters to baseband PCM audio. This emulation function eliminates the encode/decode cycle, allowing you to preview the effects of downmixing, setting dialogue level, Dolby Pro Logic decoding, and the other functions controlled by metadata and experienced by consumers.

Dolby E Latency Mode

Dolby E Latency Mode provides two options for decoding Dolby E bitstreams: **Lenient Mode** and **Strict Mode**. In **Lenient Mode**, the system absorbs Pa spacing errors in up to 130 samples before performing a correction, which results in many inaudible errors. However, this may result in latency inaccuracies in up to 130 samples. In **Strict Mode**, the system corrects all Pa spacing errors and the system always maintains the correct latency.

2.12.5 AAC and HE AAC Configuration

The **AAC and HE AAC Configuration** field provides **Default Program Reference Level and Error Concealment parameters**.

Default Program Reference Level

When you select **Default Program Reference Level**, the corresponding drop-down menu is displayed, as shown in Figure 2-33. In this menu, you can select a default dialogue normalization value (0 to –31.75 dBFS) that the AAC and HE AAC decoder applies until the system receives `dialnorm` metadata. You need to set this parameter to the dialogue level specified in the broadcast standards for the intended market. In file-based content, the average loudness information may be expressed as replay gain metadata. In this case, you should set the default `dialnorm` parameter accordingly.

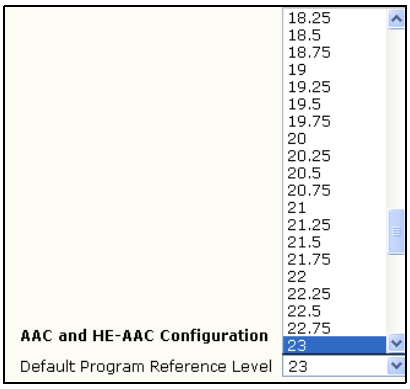


Figure 2-33 AAC and HE A AC Default Program Reference Level Menu

Error Concealment

When you click the **Error Concealment** field, the corresponding drop-down menu is displayed with two options. If you select **Yes**, the system repeats the previous frame when a stream error occurs. When you select **No**, the system mutes the current frame when a stream error occurs.

2.12.6 Dolby Pro Logic Configuration

The **Dolby Pro Logic Configuration** field provides **Dolby Pro Logic IIx Mode**, **Dolby Pro Logic II Mode**, **Panorama Mode**, **Dimension**, and **Center Width** parameters, as shown in Figure 2-34.

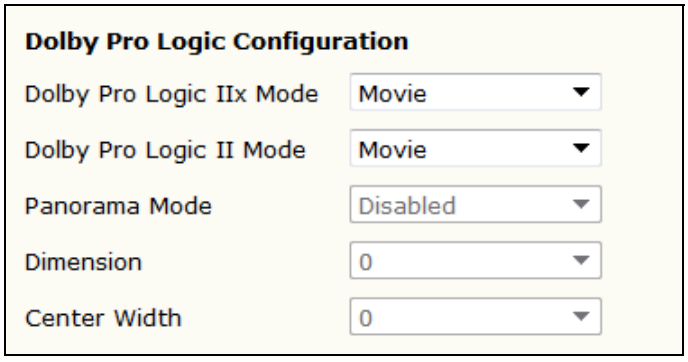


Figure 2-34 Dolby Pro Logic Configuration Parameters

Dolby Pro Logic IIx Mode

When you select the **Dolby Pro Logic IIx Mode** field, the corresponding drop-down menu is displayed.

Dolby Digital EX

Dolby Digital EX is electrically equivalent to Dolby Digital combined with Dolby Pro Logic IIx **Movie** mode with 6.1-channel outputs. However, to maintain continuity with current products and with Dolby Digital Surround EX™ content, it continues to be known as Dolby Digital EX. We do not recommend the use of a single Cb speaker in any system. Ideally, the product has a 7.1-channel output capability to readily support Ls, Lb, Rb, and Rs speakers. When a 7.1-channel product is in **Dolby Digital EX** mode, the Cb signal is divided equally (after being attenuated by –3 dB) to the Lb and Rb speakers.

Music Mode

Music mode allows users to obtain optimal results from conventional stereo programs. If a program was produced in Dolby Surround, it is ideally decoded with **Movie** mode, even when the program is music oriented.

Movie Mode

Movie mode allows users to obtain optimal results from both surround-encoded programs and conventional stereo programs. In addition, **Movie** mode offers greater spatial capabilities than 6.1 type decoders, including Dolby Digital EX. As a result, we recommend this mode for decoding Dolby Digital Surround EX soundtracks.

Dolby Pro Logic II Mode

When you select the **Pro Logic II Mode** field, the corresponding drop-down menu is displayed.

Music Mode

Music mode is the most versatile Dolby Pro Logic mode. It activates the settings on the **Panorama Mode**, **Dimension**, and **Center Width** menus; these settings can help users optimize a stereo (Lo/Ro) automotive entertainment environment or home theater system for multichannel listening.

When you select **Music** in the **Pro Logic II Mode** drop-down menu, the **Panorama Mode**, **Dimension**, and **Center Width** menus are now accessible, as shown in Figure 2-35.

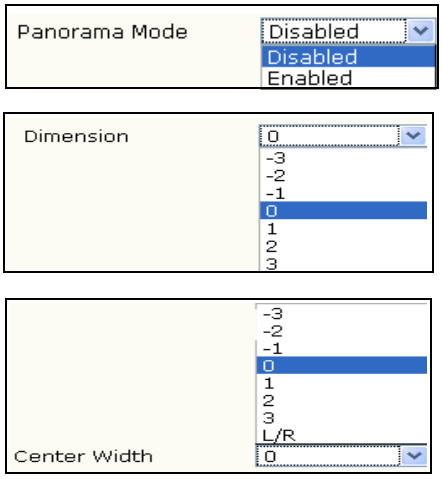


Figure 2-35 Dolby Pro Logic II Music Mode Menus

- **Panorama Mode** sends the stereo signal to the Left and Right speakers, as well as the surround speakers. This mode is not functional if **Music** is not selected in the **Pro Logic II Mode** drop-down menu.
- **Dimension** refocuses the signal from the front speakers to the rear speakers. If **Music** is not selected in the **Pro Logic II Mode** drop-down menu, the system sets the **Dimension** mode to 0 (Center).
- **Center Width** splits the Center output signal into the Center, Left, and Right outputs. If you set this mode to **-3**, the system sends all of the Center output to the Center channel. If you set this mode to **L/R**, the system outputs equally to the Left and Right channels, with no output sent to the Center channel.

Movie Mode

The standard setting for programs with video. This mode is based on the original Dolby Pro Logic decoding scheme, but the system separates the mono Surround channel into Left Surround and Right Surround channels.

Dolby Pro Logic Mode

Reproduces the original Dolby Pro Logic decoding system. Because consumer decoders now offer Dolby Pro Logic II as the default Dolby Surround decoding system, this emulation mode is available to reproduce the original Dolby Pro Logic decoding if the consumer wishes to hear it. (This option is not available on all consumer decoders made with Dolby Pro Logic II.)

Matrix Mode

Optimizes radio reception in an automotive environment. This mode is similar to the original passive Dolby Surround decoder without Dolby Pro Logic directional steering. It can also enhance mono programs, and clean up weak radio signals in automobiles. You can apply **Matrix** to a mono input by selecting the applicable **Lo/Ro** downmix mode, and then **Pro Logic II**. If you select a **Mono** downmix, **Pro Logic II** and **Pro Logic** do not function.

2.13 Configuring Loudness Measurement

The **loudness** measurement settings specify the DP580 measurement algorithm and the speech detection mode. To modify the current settings:

1. Select **Loudness** in the **Setup** menu.

The **Loudness** screen is displayed. In this screen, you can use the drop-down menus to configure the loudness measurement settings.

2.13.1 Measurement Configuration Parameters

Measurement configuration parameters consists of **Metering Mode**, **Speech Threshold**, **True Peak DC Block Filter**, **True Peak Pre-emphasis Filter, and Display all Loudness Measurements**.

To modify the **Metering Mode**, click the **Metering Mode** field to display the corresponding options, and then select the desired option.

To enable the **True Peak DC Block Filter**, **True Peak Pre-emphasis Filter**, and **Display all Loudness Measurements**, check the respective boxes.

Note: If you select ITU-R BS.1770-3 as the metering mode, the **True Peak DC Block Filter** and the **True Peak Pre-emphasis Filter** are unavailable, consistent with the definition of the specification.

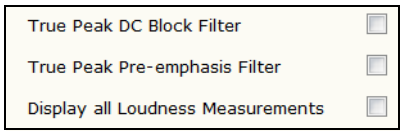


Figure 2-36 Peak and Loudness Filter Options

2.14 Modifying the Output Configuration

The **monitoring** output configuration specifies the output for each AES pair, depending on the input source. To change the AES output configuration, select **Monitoring** in the **Setup** menu.

The **Monitoring** screen is displayed.

Note: You can modify the output configuration only for a Dolby Digital, Dolby Digital Plus, PCM, or Dolby TrueHD input source. For output compatibility, AAC content is transcoded to Dolby Digital when you select Dolby Digital mode.

2.14.1 Output Configuration

The Output Configuration parameters are **AES/SDI 1/2**, **AES/SDI 3/4**, **AES/SDI 5/6**, **AES/SDI 7/8**, **HDMI, HDMI ARC, and Headphone**. You can use the corresponding fields and drop-down menus to configure these parameters. These options are identical for **AES/SDI 1/2**, **AES/SDI 3/4**, **AES/SDI 5/6**, **AES/SDI 7/8**, **HDMI**, **and HDMI ARC**.

HDMI controls the HDMI audio output mode; **HDMI ARC** controls the HDMI ARC transmission output mode.

Headphone controls which audio channel is sent by the headphone output. Headphone options are **Stereo**, **L**, **R**, **C**, **Lfe**, **Ls**, **Rs**, **Bsl**, and **Bsr**.

The system supports the **Dolby Digital** and **Passthrough** configurations, as follows.

Dolby Digital Configuration

The system supports Dolby Digital output for the following input types:

- Dolby Digital
- Dolby Digital Plus
- HE AAC with Dolby metadata

If you select **Dolby Digital** for the output configuration and the input is not one of these types, the system outputs a two-channel PCM downmix.

Pass-Through Configuration

The system supports pass-through output for the following input types:

- Dolby Digital
- Dolby Digital Plus
- Dolby TrueHD (valid only for HDMI output)

If you select **Passthrough** for the HDMI output configuration, and the input is not supported by the HDMI downstream device, the system outputs multichannel PCM based on the input and HDMI downstream device capability.

If the output mode selected and the input type are not compatible, the DP580 outputs a two-channel downmix over the specified output, except for HDMI.

SDI Output Behavior

If you select **AES** input, audio is present in the SDI output, but video is not rendered. The same is true if you select **Generate** (with the exception of A/V sync generate, which does render the video).

If you select **HDMI** input, SDI output is disabled.

2.14.2 Volume Configuration

There are three **Volume Configuration** parameters. You can select a **Volume Control** and **Dim Gain** option from their respective drop-down menus and adjust the **Master Volume** by using

the master volume up/down arrows. You can also adjust this parameter by turning the volume knob on the DP580 front panel (see Figure 1-1). As you turn the knob, the **Master Volume** value in the **Monitoring** screen changes in real time.

In addition, when setting parameters in the **Volume Configuration** menu, the following applies:

- **Volume Control** specifies the outputs affected by the master volume.
- When you click the **Dim** check box, the system applies the attenuation value selected in the **Dim Gain** menu.

2.14.3 HDMI Sink Device Status

If an HDMI sink device is connected, the system displays information regarding the current connection (lock status, number of channels, supported codecs, and supported speakers), as shown in Figure 2-37.

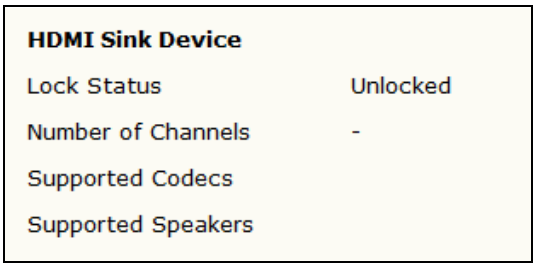


Figure 2-37 HDMI Sink Device Screen

2.14.4 EDID Configuration

There are four **EDID Configuration** parameters: **Number of Channels, Dolby Digital, Dolby Digital Plus, and Dolby TrueHD**. Extended display identification data (EDID) sends a signal over HDMI to the source device, specifying the input signals that are currently acceptable to the DP580.

You check or uncheck the corresponding Dolby codecs to specify which codecs the DP580 will accept as an input source.

Number of Channels

This parameter specifies the number of channels that the DP580 will accept as an input source (two, six, or eight channels).

2.14.5 HDMI ARC Sink Status

If an HDMI ARC sink device is connected, the system displays information regarding the current connection status and supported codecs.

2.15 Modifying the Network Settings

The network settings specify the DP580 command and media IP configurations. To modify the current network settings, select **Network** in the **System** menu.

The **Network** screen is displayed. In this screen, you can change the current **Command** and **Media** configurations.

2.16 Using the Administrative Controls

These administrative controls allow you to upgrade the DP580 and perform other tasks, including modifying the Network Time Protocol (NTP) configuration. To access the administrative controls, select **Admin** in the **System** menu.

The **Admin** screen is displayed.

Upgrading the System Software

To upgrade the software:

1. Obtain the upgrade .dlb file from Dolby Laboratories, and copy it to your PC.
2. Navigate to the **Admin** page.
3. Click **Browse** to locate the upgrade file on your PC.
4. Click **Upload** to upload the file to the DP580.
5. Click **Upgrade**.
6. Wait until the following message is displayed: **Upgrade Completed. Please Press Reboot.**
7. Reboot the system by clicking the **Reboot** button on the **Admin** page.

Caution: Do not reboot or remove power to the DP580 while upgrading.

Caution: Check the version numbers in the **System Info** section of the **Admin** screen. If the field-programmable gate array (FPGA) and MicroBlaze versions do not match the version numbers in the upgrade notification you receive, the upgrade did not successfully complete, and you must perform the upgrade again. If the FPGA and MicroBlaze versions are both 0, press the **Reboot** button in the **Admin** screen, and then check again. If the FPGA and MicroBlaze versions remain at 0 after rebooting, contact your Dolby technical representative.

A series of messages displays on the screen. After the system completes the upgrade, it reboots, and then displays the upgraded version of the software in the **Admin** screen, as shown in Figure 2-38.

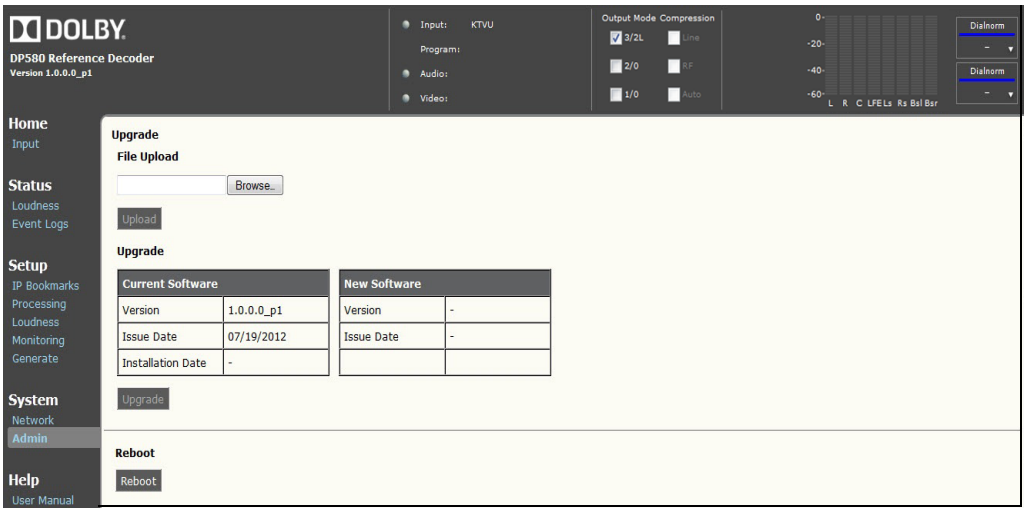


Figure 2-38 Admin Screen Displays New Software Version After Rebooting

Reboot Button

To reboot the system at any time, click the **Reboot** button.

Reset System Settings

This function allows you to reset the system to default settings:

- Two options in the **Reset System Settings** field, **Include IP Bookmarks** and **Include Network Configuration**, allow you to delete either or both of these settings by clicking the respective box. Otherwise, the system retains the two settings when resetting the defaults.
- **The Full Factory Defaults (Includes IP Bookmarks and Network Configuration)** option allows you return the system to all of the factory defaults, deleting all current settings.
- To reset the system settings, click the **Reset button**.

NTP Configuration

This function allows you to enable and set the NTP server and backup server addresses. The **NTP Status** field provides the status of the NTP server in use.

Reset System Clock

This function allows you to reset the time zone and the date and time by clicking in the respective fields.

Download System Logs

If you experience any system issues, these logs provide detailed troubleshooting information that you should send to Dolby Laboratories. To download system logs, click the **Download** button in the **System Logs** field.

Note: After you click the **Download** button, a dialog box is displayed, in which you can open or save the corresponding .zip file.

System Info

This section displays the DP580 serial number.

2.17 Resetting Factory Defaults from the User-Control Screen

To reset the DP580 to factory defaults from the user-control screen, use the front-panel navigation keys, shown in Figure 2-39.

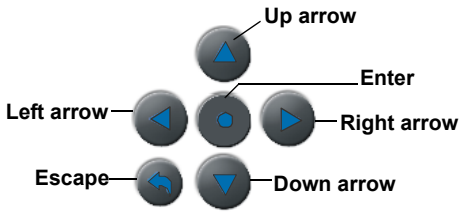


Figure 2-39 Front-Panel Navigation Keys

1. Press the escape key to select the **DP580 menu**.
2. Press enter to select **System Settings**.
3. Press enter again to display the **System Settings menu.**
4. Press the down arrow, then enter to display the **Reset Settings menu**.
   Be sure that **Factory** is displayed to the right of the **Reset** line.
5. Press the down arrow to select **Apply**.
6. Press enter to reset the system to the factory defaults.
   The unit automatically reboots and takes a while to start up.
7. When the unit reboots, press the right arrow to display the **CMD Interface** settings and wait until the IP address is 192.168.1.2.

Associated Audio Mixing

A Dolby® Digital Plus™ input may include one or more (maximum of seven) associated audio streams. The Dolby Digital Plus decoder can mix the main audio stream with any available associated audio stream, as specified for Digital Video Broadcasting in Annex E of ETSI TS 101 154. The system transmits a descriptive track as a separate bitstream alongside the main soundtrack and can mix the tracks within the decoder. The associated audio stream and the main audio stream can reside in a single PID or in separate PIDs. This associated audio mixing approach can deliver directors' commentaries or audio descriptions for the visually impaired while maintaining the highest possible bandwidth efficiency. Associated audio mixing eliminates the need to prepare and transmit multiple final mixes to support different audience needs and preferences. The Dolby Digital Plus metadata specifies the audio level for associated audio mixing.

3.1 Configuring Associated Audio Mixing

To configure associated audio mixing:

1. Select **Processing** in the **Setup** menu.

   The **Processing** screen is displayed. In this screen, you can set up associated audio mixing for a Dolby Digital Plus configuration.

2. Click the **Associated Audio Mixing** field, and select **On** to enable this option.
3. Click the **Default Associated Audio Type** field, and specify which available audio stream you want to mix with the main audio stream.

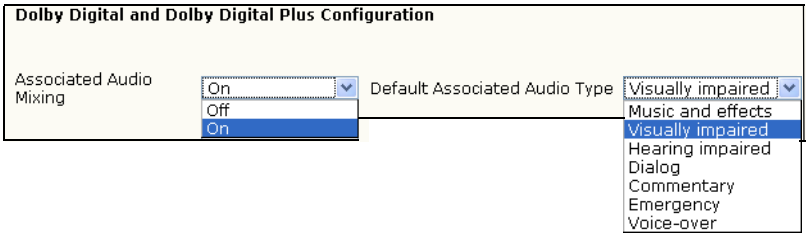


Figure 3-1 Associated Audio Mixing Menus

3.1.1 Mixing Associated Audio from a Single PID

To mix an available associated stream from a single PID, in the **Input** screen, select an IP, ASI/SDI, or AES input source that contains a single PID with one or more associated audio streams.

The **Input** screen displays information for the selected IP source, which contains one program with two PIDs. **PID 256** contains the video stream, and **PID 258** contains the main audio stream and the associated audio stream, as shown in Figure 3-2. The system mixes an available associated stream by default. It is highlighted in gray with green borders under **PID 238** at the left side of the display. The gray highlighting indicates that it is the currently selected stream. The green border indicates that associated stream mixing is

activated (also indicated under the **Monitor Status** on the right). The corresponding bitstream, downmixing, and mixing metadata, as well as other information, is also displayed on the right for the main stream and the associated stream (see Figure 3-2).

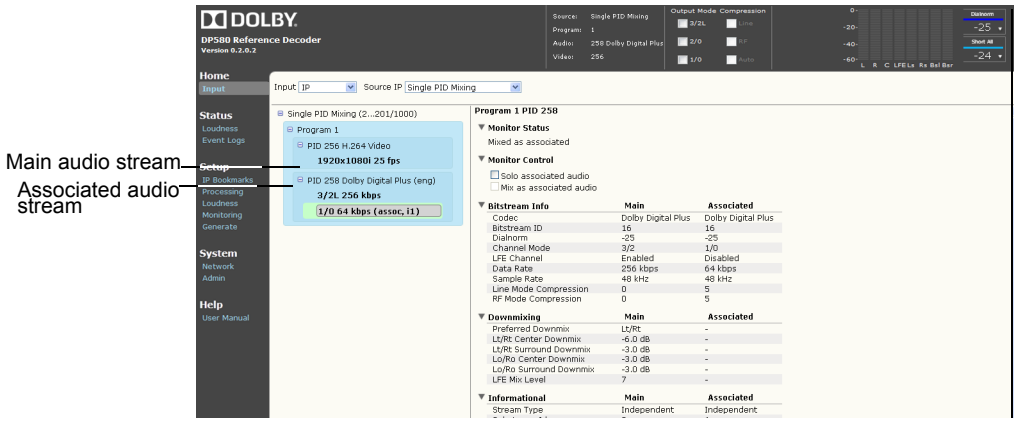


Figure 3-2 Main and Associated Audio Stream Information (Single-PID Mixing)

3.1.2 Monitoring an Associated Stream Only (Single PID)

To monitor only the associated stream, click **Solo associated audio** under **Monitor Control**. The **Monitor Status** indicates **Mixed as associated (soloed)**, as shown in Figure 3-3.

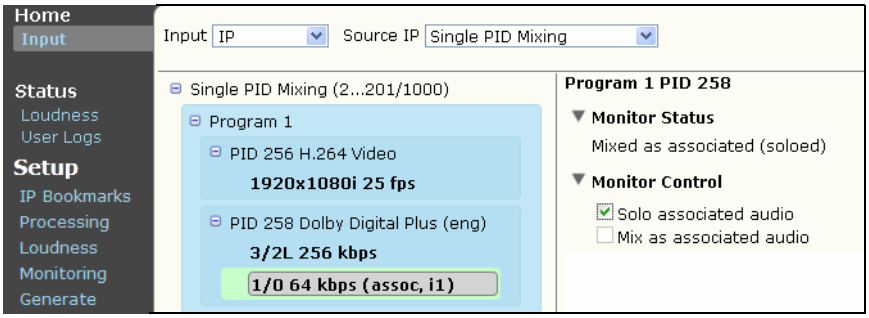


Figure 3-3 Associated Stream Monitor Control: Solo

In solo mode, when you select the main stream, it is highlighted in gray and the **Monitor Status** indicates **Main substream (muted)**, as shown in Figure 3-4.

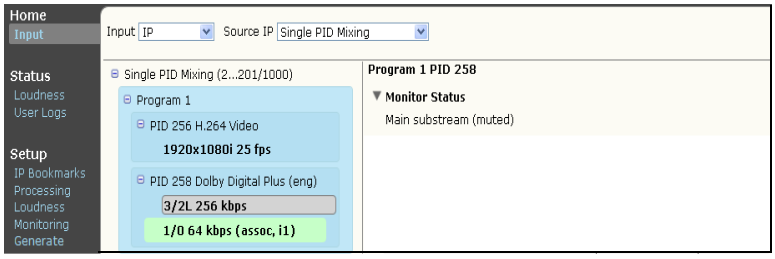


Figure 3-4 Main Stream Monitor Status: Muted

To play only the main stream, turn off associated audio mixing.

3.1.3 Manually Mixing an Alternative Associated Stream

If the specified associated stream is unavailable, the **Monitor Control**/**Mix as associated audio** check box is now activated. You can force the system to mix an alternative stream by selecting the stream and clicking on this check box. You can also check the **Solo associated audio** box to activate solo mode.

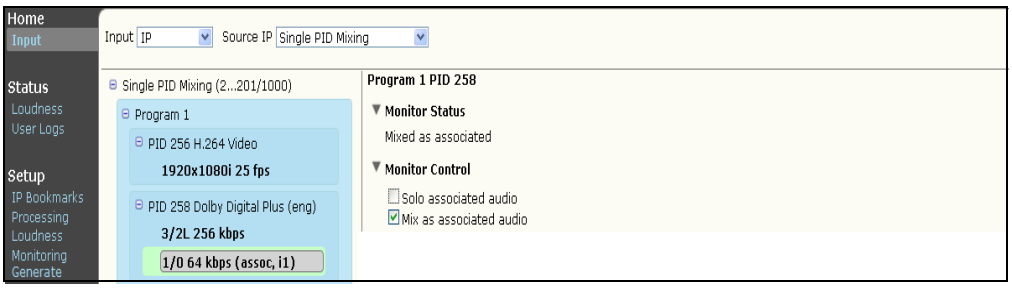


Figure 3-5 Force Mixing with an Alternative Stream

3.2 Mixing Associated Audio with Dual Packet Identifiers

To mix an available associated stream from two PIDs:

1. In the **Input** screen, select an IP or ASI source that contains a dual PID with one or more associated audio streams.

   The **Input** screen displays information for the selected IP source, which contains one program with multiple PIDs. In Figure 3-6, PID 256 contains the video stream, PID 258 contains the main audio stream, and PID 259 contains the associated audio stream. On the right, associated audio information is displayed.

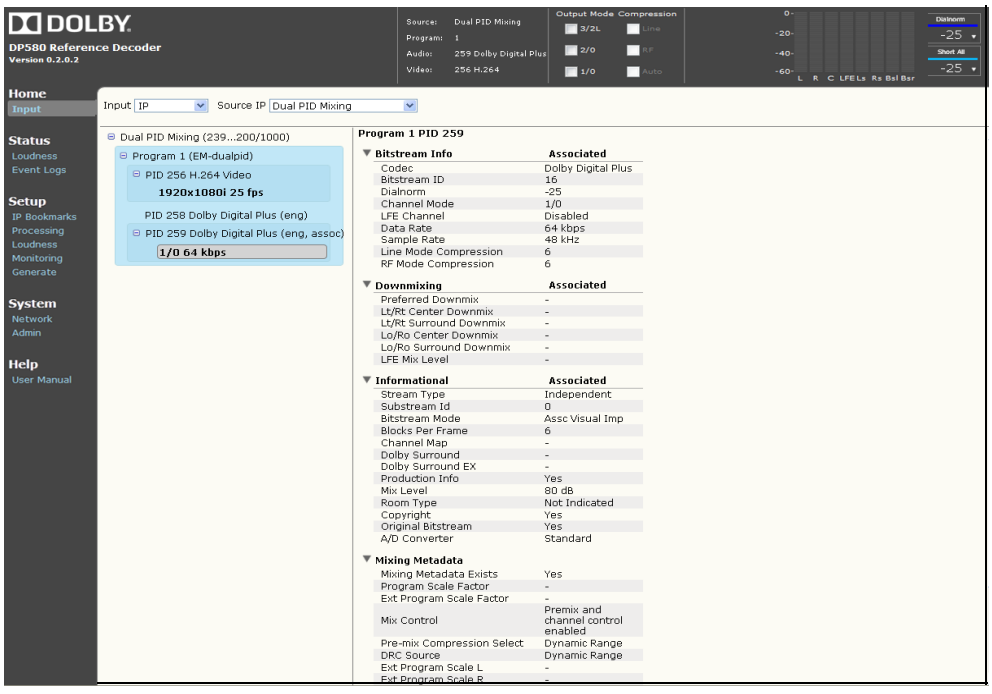


Figure 3-6 Associated Audio Stream Information (Two Audio Packet Identifiers)

2. To mix an associated audio stream, select the stream to highlight it, and then check the **Monitor Control**/**Mix as associated audio** box (for PID 259 in the example).

The selected associated stream is now highlighted in green, and the **Monitor Status** indicates **Mixed as associated**. Information for both the main and associated streams is also displayed.

Note: To monitor only an associated stream, double-click the stream. To monitor only the main stream, double-click the main stream.

Dolby E Decoding Behavior

The Dolby® DP580 supports reference decoding of Dolby E over AES, ASI/SDI, and transport streams through SMPTE 302M. The system performs the following functions:

- Monitors multichannel audio (one program at a time from a Dolby E stream)
- Monitors two-channel audio from the selected Dolby E program
- Displays Dolby E metadata for all programs
- Emulates Dolby E metadata for multichannel output (configurable) and two-channel output

4.1 Dolby E Program Selection

The DP580 enables you to select a single program to monitor from a Dolby E stream. For example, if the Dolby E program configuration is 5.1+2, you can listen to the 5.1-channel program (program 1) or the two-channel program (program 2). By default, program 1 is always selected when monitoring a new Dolby E stream.

The AES, HDMI, and multichannel analog outputs reflect the currently selected program. The headphone always provides a confidence downmix of the currently selected program. If you specify **Downmix** or **Dolby Digital** for the output configuration, the system routes a two-channel downmix of the currently monitored program to that output.

4.2 Dolby E Metadata Emulation

The DP580 provides an option that allows you to emulate the effects of the Dolby Digital encode/decode process, which simulates the end-user listening experience. The emulation process performs the following:

- Application of dialogue normalization
- Dynamic range control computation and application
- Worst-case downmix level calculation to prevent clipping
- Downmixing with metadata application

Metadata emulation is enabled or disabled as specified in the respective configuration.

Dolby DP580 Specifications

A.1 Processing Capabilities

Audio Formats Supported

Dolby® Digital, Dolby Digital Plus™, Dolby E, AAC, HE AAC, HE AAC v2, MPEG-1 LII, PCM, and Dolby TrueHD.

Audio Frame Latency

During the decoding process, the system maintains audio frame latency on the AES and SDI inputs for the applicable codecs, as shown in Table A-1.

Table A-1 Audio Frame Latency: AES, SDI, HDMI

Input	Frame Rate	Codec	Latency (ms)
AES	N/A	PCM	32
AES	N/A	AC-3	32
AES	N/A	E-AC-3	32
AES	N/A	AAC	42.7 (approximate)
SDI	25	All	40
SDI	29.97	All	33.4 (approximate)
SDI	30	All	33.3 (approximate)
SDI	50	All	40
SDI	59.94	All	33.4 (approximate)
SDI	60	All	33.3 (approximate)

Note: Audio latency over HDMI™ will be added in a future release.

Video Formats Supported

H.264 and MPEG-2

Table A-2 shows the video resolutions and frame rates supported for high-definition and standard-definition displays.

Table A-2 Video Resolutions and Frame Rates

High-Definition Resolutions	High-Definition Frame Rates (fps)	Standard-Definition Resolutions	Standard-Definition Frame Rates (fps)
1080i	25, 29.97, 30	480i	29.97
720p	59.94, 60, 50	576i	25

Peak Measurement

Determines the unweighted true-peak level per ITU-R BS.1770-2

SDI Output Specifications

Table A-3 shows the output modes, resolutions, and frame rates for the SDI output.

Table A-3 Specifications for SDI Output

Mode	Resolution	Frame Rate (fps)
SD-SDI	720 × 480i	29.72 (NTSC)
	720I × 576i	25 (PAL)
HD-SDI	1280 × 720p	50/59.94/60
	1920 × 1080p	23.98/24/25/29.97/30
	1920 × 1080i	25/29.97/30
3G-SDI	1920 × 1080p	50/59.94/60

A.2 Environmental Characteristics

Power Specifications

100–240 VAC; 50–60 Hz; 350 W; front-panel power switch

Dimensions and Weight

1-U rackmount: 44 × 483 × 394 mm (1.75 × 19 ×15.5 inches)

Net: 6.5 kg (14.5 lb)

Environmental Conditions

Operating temperature range: +10°C to +35°C

Humidity range: 5% to 90% (noncondensing)

Regulatory Notices

UL, FCC, CE, and RoHS compliant

Index

administrative controls....37–39
AES
  input source....15–16
ASI/SDI
  input source....16
associated audio mixing....29, 41–44

changing loudness display....22
checking loudness status....20
command interface
  configuring....10
configuring
  decoder....26
configuring the network
  command interface....10
  media interface....10
connecting to the DP580....11

decoder configuration....25–33
Dolby E
  behavior....45
  metadata emulation....45
  program selection....15, 16, 45
  SDI/ASI input....16
  transport stream....15
downloading loudness logs....22
DP580
  front panel components....2–4
  rear panel components....4–5

EDID Configuration....36
event logs....24–25

hardware
  installing....8
HDMI
  input source....16–17
  monitoring Audio Return Channel receiver input....20
  monitoring Audio Return Channel transmitter output....19
HDMI sink device status....36

input source....12–20
  AES....15–16
  ASI/SDI....16
  HDMI....16–17
installing hardware....8

logs
  event....24–25
  loudness....23
  system....39

loudness
  logs....23
  measurement configuration parameters....34
  parameters....23
loudness display
  changing....22
loudness logs
  downloading....22
loudness parameters....23–24
loudness status
  checking....20

media interface
  configuring....10
monitoring
  modifying output....34
  modifying volume....35

Pro Logic II mode....32
  matrix mode....33
  movie mode....33
  music mode....32
processing....25–33
  AAC and HE AAC....30–31
    default program reference level....30
    error concealment....31
  compression mode....27
  decoder
    tech bulletin 11....29
  Dolby Digital EX mode....32
  Dolby Digital Plus
    associated audio mixing....29, 41
    MS10 emulation....30
  Dolby Digital/Dolby Digital Plus....29–30
    error concealment....30
  Pro Logic....31–33
  Pro Logic II mode....32
    center width mode....33
    dimension mode....33
    movie mode....33
    music mode....32
    panorama mode....33
    Pro Logic mode....33
  Pro Logic IIx mode....32
    movie mode....32
    music mode....32
  stereo downmix mode....28

SDI behavior....35
software
  upgrading....37–38

streaming external files 18
system logs 39

transport stream
    input source 14–15
    ip bookmarks 14

upgrading software 37–38

web client user interface 11